Telephone Engineer

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APRIL, 1928

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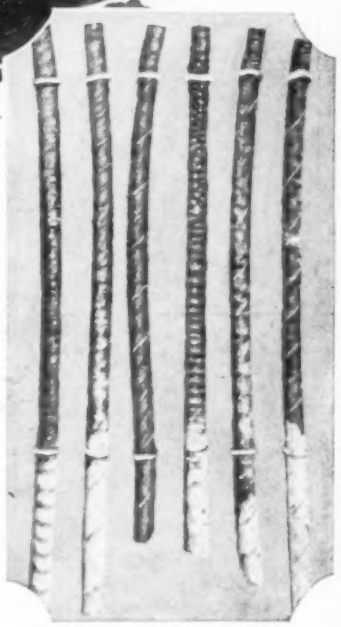

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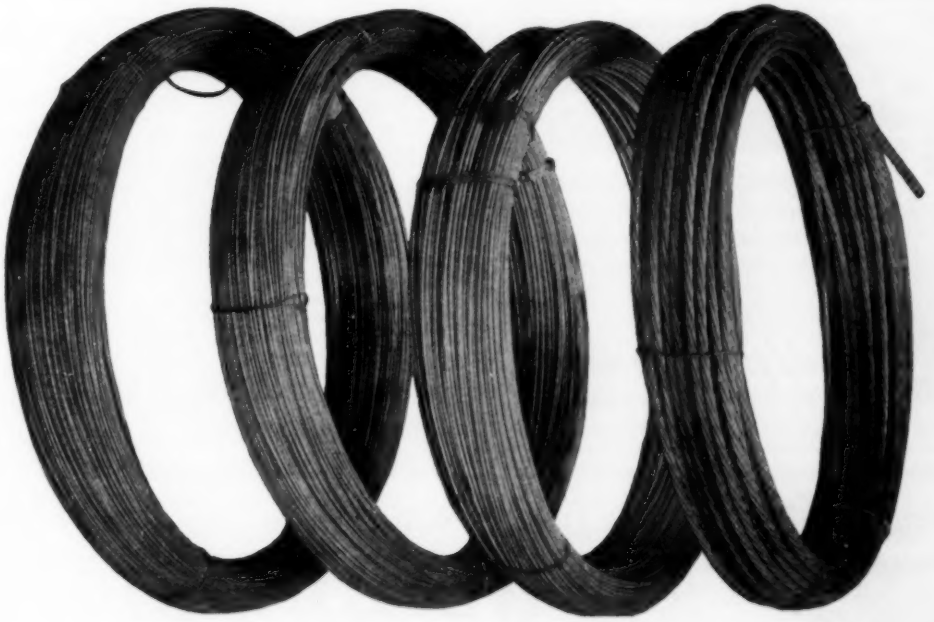

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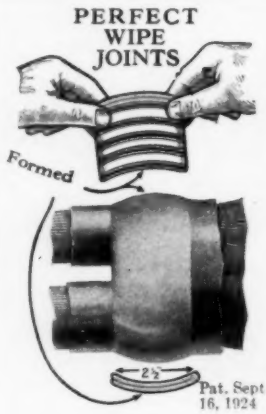


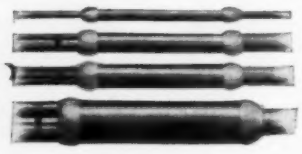

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# Telephone Engineer

Volume 32 APRIL, 1928 No. 4

### 78% Toll Traffic Handled by A-B Toll Methods

In the annual report of The Southern New England Telephone Company appears the statement that 78% of Connecticut toll traffic is now handled by A-B toll methods. An accompanying chart shows that the average speed of connection of all toll messages has been reduced from four and a fraction minutes in 1922 to slightly over one minute in 1927, while the total number of messages has increased over the same period from twelve millions to twenty millions annually.

It is rather surprising to learn that such a large percentage of the toll calls in an entire state are being handled by A-B or two number methods. This must have involved the development of up-to-date directory methods whereby telephone numbers of other exchange areas are available to subscribers in the calling exchange area and of other special operating methods. The fact that Connecticut is a state of small area with a dense population and a proportionately large number of large cities and towns, of course, makes it a suitable area for the development of this type of service.

Not every area is as suitable as Connecticut for the use of A-B toll operating methods but there is room for improvement of the methods used in many places in order to attain greater speed of connection and gain the increase in toll circuit capacity that results. For instance, it is commonly found that a large percentage of the traffic originating at a tributary office terminates at the nearby toll center. It is not unusual to find the tributary subscriber giving his call to the tributary operator, who in turn calls the toll center and passes the ticket to the toll center operator. It is not uncommon to have the toll circuit released and again taken up when the ticket is worked in the order of its filing time.

All of this involves waste of operating and circuit time which may be avoided by better operating methods. The tributary operator may ticket and complete her own calls for this type of traffic or the subscriber may be connected to the toll center operator and the call ticketed and completed there using whatever method of operation is best suited to the particular situation. Both of these methods are in use with satisfactory results and there may be others.

The study and application of methods for improving speed of connection and reduction in operating labor has invariably been found to be profitable, and no manager can afford to overlook the opportunity for improvement in his own territory.

---

### As to Mass Ownership of Utilities

Financial pages of various journals have recently carried discussions of the relative advantages and disadvantages of having corporation stock widely held in the hands of the public or of having control concentrated in a small group of people who are directly in charge of the management of the corporation. The American Telephone and Telegraph Co. is cited as a case where the stock is widely held and the management is in the hands of men who have a small financial interest in the company compared to the total voting stock. Contrasted to this are Dupont, General Motors and some of the railroads where those who manage the affairs of the corporation also have a very heavy interest in its controlling stock.

As usual with such discussions, the point has been overlooked that there is no one form of organization which is a guarantee of financial success. A. T. & T. with one form of organization is a financial success as is, likewise, General Motors with another form. No one can be certain as to whether or not these corporations would be equally successful if the forms of organization were interchanged. In the case of public utility companies, it is usually considered to be of advantage to have securities distributed among a large number of small holders who are customers of the utility.

The same question may arise as to the form of organization best suited for a smaller telephone

company. There are successful companies with both forms of organizations. In general, it seems that the more conspicuously successful of the smaller organizations are those in which the management and supervisory forces are interested and perhaps in control of the company, but where the public service also has an interest as a group of owners of preferred stock or other securities of the company.

---

**Farmer Owned Telephone Lines**

We have attended a number of telephone meetings recently, ranging from state conventions to district meetings with a few miscellaneous meetings thrown in for good measure. At all of these meetings we have been struck by the amount of criticism that has been leveled at our farmer friends who are attempting to maintain their own telephone service. It seems that every possible service difficulty occurs on the farmer-owned lines and if we are to believe some of the speakers at the meetings and more of those who take part in the discussions outside the meetings, it is absolutely impossible to expect any improvement in the situation.

We will agree that there is much bad service on farmer-owned lines and through mutual exchanges and we will agree that the best solution would be to have the lines and exchanges owned by live commercial companies which will put the lines in shape and bring the service up to the proper level. We can not agree that the fault lies entirely with the farmer. We wonder how many of the critics ever met the farmer on his own ground and showed a kindly interest in his problem of providing telephone service.

There are managers who do not find the service line problem to be insoluble. They obtain results, not by criticizing but by encouraging the farmer to provide better lines and by helping him over the difficult places in the building and maintaining of his line. Once the interest in getting good service is aroused in a group of farmers on a service line, they will do a surprisingly large amount of work to get their lines in shape. But the way to arouse interest is to show interest rather than to criticize.

---

**Increased Rates the Answer**

A few days after the heavy sleet storm that visited the states near the Great Lakes late in March, two officials of a country telephone system appeared at the state capitol looking for relief and assistance from some of the commissions. According to the news reports, one of them stated that "the only thing running in the telephone office was the clock." The entire 365 telephones were out of order and the operator left because there was nothing to do.

A visit to the public service commission resulted in an application for increased rates and the tax board was asked to take the condition into consideration in fixing the tax assessment. It was stated that the annual dues of subscribers had been $1 per year and that this amount was found to be insufficient to keep up the property.

A sleet storm is pretty drastic remedy for a telephone system, ill from undernourishment due to starvation rates, but it seems that no other corrective will have any effect upon subscribers and management in some cases.

---

**Are Ground Connections Economical?**

In the course of a round table discussion at the recent conference of Indiana Telephone plant men sponsored annually by Purdue University, there developed an interesting discussion on the subject of ground connections. It seems that one of the larger companies of the state has been investigating the matter of ground connections and the study brought to light a number of conditions that might easily be overlooked. The general discussion indicated that most companies assume that driven ground rods give adequate earth connections and pay no further attention to the matter.

As a matter of fact, measurement of ground connections will show that there are many high resistance grounds and to this fact may be traced a multitude of major and minor troubles. In the old days of ground return lines—and there are still thousands of telephones operating on ground return circuits—repairmen soon learned to suspect the ground connection in cases of poor transmission and weak ringing. In the modern plant, where the ground connection serves principally for connection to one terminal of the office battery and for protector grounds, a high resistance ground may exist without arousing suspicion.

It is not certain as to how much loss of equipment and of cable conductors may be assigned to poor ground connections but it is certain from some of the experiences related at the conference that the amount is greater than is commonly realized. As a result of the discussion, there arose a demand for information as to proper methods of making ground connections and for easy and reliable methods of testing connections already established. It is to be hoped that some of those who have been studying the question and who have accumulated information will put this information into shape for publication so that the industry at large may profit from what they have learned.

# Continuous Loading and Loading Coils

By F. J. DOMMERQUE

### Krarup Cables

The loading coil pots, small ones on crossarms for open lines, large ones resting on platforms half ways up the pole for cables, are a familiar sight along the highways. With increasing use of the loading coils on land lines, the desire made itself felt for application also not only to submarine cables in deepsea waters but also in shallow water across bays and wide rivers. Imagine, however, the difficulties that would arise in laying cables with loading coils and maintaining same in deep water. A cable was laid across a lake between Germany and Switzerland in 1906 about 8 miles long, and also between England and the continent, containing loading coils, and although the loading coils were made long and thin, about 12 inches long and 3 inches in diameter, the cable itself being a four conductor cable measuring over the coils not more than 4¾ inches, the difficulties met with were such as to invite some other means of increasing the inductance in submarine cables than the insertion of coils at certain intervals.

A Scandinavian engineer, Krarup, invented the so-called Krarup method of continuous loading of cables by surrounding the copper core of a cable with a winding of thin iron wire. Of course this method was not applicable to open wire, but it found great favor for submarine cables. The first Krarup cable on this continent was the Vancouver-Manaimo cable. It was 28.3 nautical miles long and was a gutta-percha cable; it contained only two physical circuits. A number of Krarup cables were laid in Europe and only a few years ago three single conductor Krarup cables were laid between Havana and Key West; they were also gutta-percha cables on account of the great depth of the ocean. For ocean depths of, say, 500 feet, paper cables with Krarup wire envelope have been frequently used in Europe. Some cables have a Krarup winding of a thin iron ribbon instead of wire. After the vacuum tubes had come in use as amplifiers and it was made possible to construct repeatered lines, the time had come for the expansion of the use of cables over long distances. In this country these long distance cables were laid in tile ducts the same as in the familiar conduits in the cities and towns, with the insertion of loading coils in manholes along the line. In Europe frequently Krarup cables were used for underground connections between overhead toll and long distance lines, and were buried directly into the ground on a bed of sand. In this country wherever the use of loading coils is possible, no continuous loading is applied, as the coil loading is the more efficient of the two, only where coil loading is impossible or difficult to install and maintain, continuous loading is taken into consideration.

The manufacture of submarine cables with long thin loading coils has progressed considerably, not here perhaps, but in Europe. In consequence a new cable was laid between Germany and Denmark in 1926 about 30 miles long with loading coils and 48 conductors for phantom work. This was a paper cable, lead covered and armored. A few more cables of this kind were laid in 1927 between Germany and Sweden and to the islands in the North Sea. At the present date there is no telling which of the two methods of increasing the inductance will gain the upper hand; most likely both methods will be still further developed and each one will find its proper field of utility.

but a few words of explanation may be added. There are three cables all of the same construction. There is a deep sea part (type D) having a single copper conductor 0.115 inch in diameter surrounded by five copper tapes. Around this is laid the loading winding consisting of a single close layer of iron wire 0.008 inch in diameter and having approximately 120 turns of this wire per inch length of the conductor. Then the loaded conductor is treated with Chatterton's compound and insulated with a gutta-percha mixture applied in three layers, thus forming a core, which is protected by the armoring. The part in the deepest water has an armoring of steel wire 0.192 inch in diameter. This wire is galvanized and coated with a preservative compound before it is applied to the cable; in addition it is wrapped with an impregnated fabric tape for protection and flexibility. Before the armored wire is applied the core is served with tanned jute yarn to form a bedding for the armor wires.

Next to the deep sea part of cable is an intermediate part (type B), its armor wire is thicker and made of soft iron, otherwise treated the same as the steel wire in type D. This part located in shal-

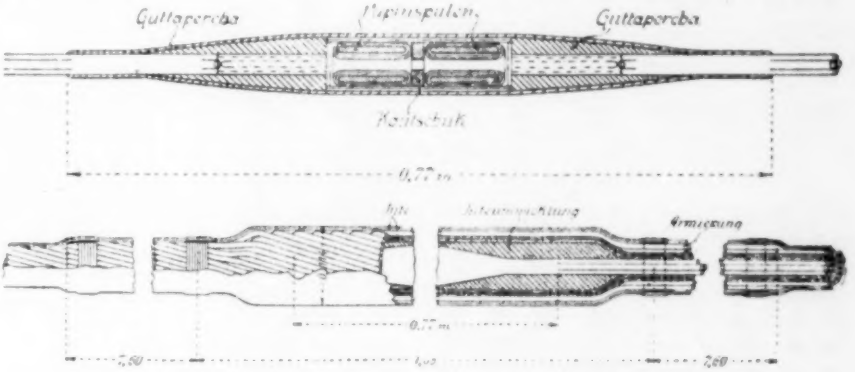


*Fig. 1—European Submarine Cable with Loading Coil Inserted.*

In Fig. 1 is illustrated in cross section a piece of the submarine cable laid in the lake between Germany and Switzerland. The loading coil is in the center, as is plainly visible in the illustration (upper cut); the lower part of the illustration shows the application of jute and the armor with the coil left out. Fig. 2 presents a number of cross sections of the cable used between Havana and Key West. This illustration is from a paper published by Martin, Anderegg and Kendall* on this cable system. The notations on the cuts make their construction clear, lower water is more exposed to injuries. The shore end portion (type A) has the heaviest armor on account of being most exposed.

It will be noticed from Fig. 2 that around the loaded core a copper tape is laid with short enough lay to provide a safe overlap. Upon this tape two more heavier tapes are applied with a much longer lay. This tape provides a return conductor.

This kind of submarine cables belongs to the class designated as "sea return" cables. Its main core with the loaded

*Journal A. I. E. E., February, 1922.

central conductor and uninsulated return conductor extends through the entire length of the cable, the copper tapes applied to the outside of the core are to diminish the losses caused by the sea return. To reduce as much as possible all disturbances from outside sources the portions of the cable near the ends are made metallic, that is, the cable has two cores (type $A^2$), thereby carrying the return part of the circuit some distance out to sea before connecting it to the "sea ground." The return core is the same as the main core but has no loading iron nor the heavy copper tapes. At the sea and the return conductor is welded to the conductive tape on the main core.

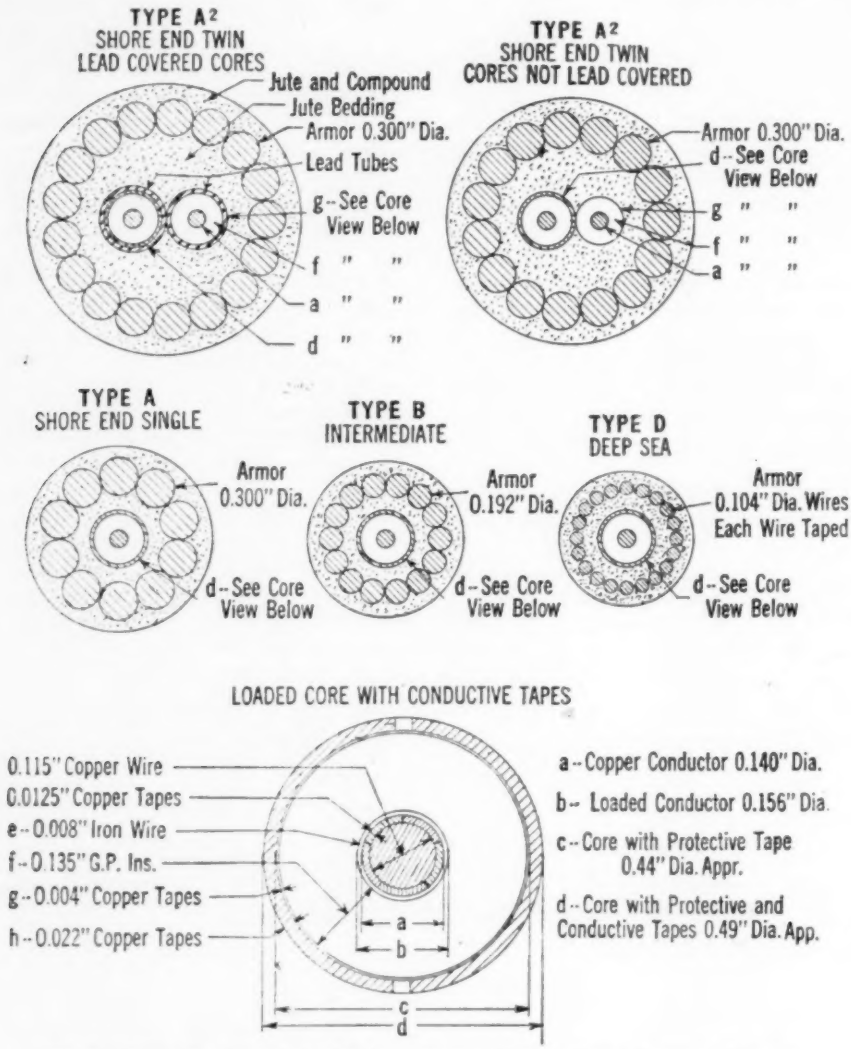


*Fig. 2—Cross Section of the Various Types of Cable Used Between Havana and Key West*

Fig. 3 is a cross section of a European loaded paper telephone cable. There are three times four telephone conductors, each of the four conductors being wound with two layers of fine wire forming the Krarup envelope. Then the four are wrapped in paper and formed into quads. The three single conductors are telegraph wires. The entire core is held together by a spiral of strong steel wire, which takes the load off the core. Next follows a double lead-sheath, around which a layer of jute compound is laid and then the armor, which in this case is composed of iron wires of a special shape; this wire is galvanized and formed so as to build up into a closed tube which will preserve the circular shape of the lead sheath. The outside envelope is again of jute compound.

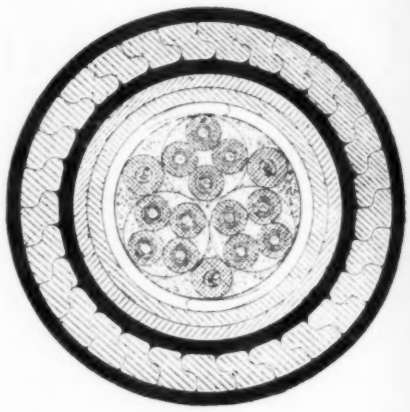

*Fig. 3—European Loaded Submarine Cable*

In the United States a number of coil loaded submarine cables have been laid, but all in shallow water. We give a table from Shaw and Fondiller's paper, describing the properties of five such cables; the Raritan Bay cables have 37 quads loaded at 5 points, 111 coils at each point.

| Location. | Year of installation. | Length of cable, miles. | No. of load, points. | Number of loaded circuits. | | Coil spacing, miles. | Coil inductance, Henrys. |
|---|---|---|---|---|---|---|---|
| Chesapeake Bay No. 1 | 1910 | 4.5 | 2 | 17 pr. | No. 13 A. W. G. | 1.97 | 0.117 |
| Chesapeake Bay No. 2 | 1916 | 4.0 | 1 | 12 quads | No. 13 A. W. G. | 2.0 | 0.067—Side<br>0.042—Phantom |
| Tarrytown-Nyak | 1916 | 2.7 | 2 | 37 quads | No. 16 A. W. G. | 0.89 | 0.250—S<br>0.155—P |
| Raritan Bay No. 1 | 1917 | 5.3 | 5 | 37 quads | No. 16 A. W. G. | 0.91 | 0.250—S<br>0.155—P |
| Raritan Bay No. 2 | 1918 | 5.3 | 5 | 37 quads | No. 16 A. W. G. | 0.89 | 0.250—S<br>0.155—P |

The cable and coils are spliced on a barge and then sunk into the bay.

**Connecting of Loaded Lines**

When a line consists throughout of conductors having the same electrical constants, and it is loaded, it merely becomes a matter of effecting the most perfect insulation, of making the proper transpositions in case of open wire construction, and of placing the loading coils at the correct intervals, to render the attenuation a minimum.

When, however, a line is composed of sections differing in gage of conductors and type of construction, and is loaded, particular care must be exercised to avoid reflection losses. This is accomplished with the best results by arranging the loading so as to have the characteristic impedance the same for all the sections of different construction and different electrical constants.

The problem of arranging the different sections so as to give all sections practically the same characteristic impedance and to render the sections otherwise as nearly symmetrical as possible, is best illustrated on a concrete example.

It is a well-known fact that it is difficult to bring long distance lines into the center of cities by open wires; consequently switching stations have been established at the outskirts of cities, whence the toll and long distance lines are brought into the board by cables to carry the traffic to and from the city, while through-traffic is switched directly over the open wire circuits passing through the switching station.

Suppose the switching station is con-

nected to the tollboard by a cable of No. 16 B. & S. conductors six miles long, and of a capacity (mutual) of 0.074 microfarad per mile. From the switching station in one direction an open wire circuit of No. 8 B. W. G. may extend for 150 miles, and in another direction for 100 miles, the No. 8 wire having a capacity of 0.009 microfarads per mile. Employing for the open wire circuits heavy loading, that is, 0.2 henry in each loading coil, and spacing the coils 8 miles apart, would give in the case of the 150-mile circuit 18 coils. To obtain symmetrical spacing there should be 152 miles to the circuit; then the first coil could be placed 4 miles from the switching station, the next one 12 miles and so on, leaving again 4 miles from the last coil to the end of the line. Thus, as the section is only 150 miles long, a deviation from the full 8 miles spacing would have to be made, which would, however, be slight.

The 100-mile circuit with 12 coils would deviate still more from a symmetrical spacing if the 8 miles between coils were exactly adhered to. In the first case the symmetrical spacing with 150 miles would require a distance between coils of practically 7.9 miles and in the second case of practically 7.7 miles. In our example for sake of simplicity an 8-mile spacing may be used for figuring; in practice a small deviation from the 8-mile distance between coils would not increase the reflection losses appreciably as the values of the characteristic impedances of the two sections are substantially the same. In the case under consideration, where the inductance is large in comparison to the resistance the characteristic impedance has very nearly the value $\sqrt{\frac{L}{C}}$; hence the open wire sections would have a characteristic impedance

$$Z_o = \sqrt{\frac{\frac{0.2}{8}}{0.009 \times 10^{-6}}}$$

$$= 1000 \sqrt{\frac{0.025}{0.009}} = 1666 \text{ ohms.}$$

The following reasoning will give an easy means to determine the characteristic impedance for the cable section. The No. 8 open wire circuits are equipped with a coil for every 8 miles; the capacity of the No. 8 wire is 0.009 $\mu$ f. per mile, whence the capacity corresponding to one coil is $0.009 \times 8 = 0.072$ $\mu$ f.

The No. 16 cable has a capacity of 0.0714 $\mu$ f. per mile and $6 \times 0.0714 = 0.4284$ $\mu$ f. for its 6 mile length. Thus, the 0.4284 $\mu$ f. of the cable correspond to $\frac{0.4284}{0.072} = 5.95$ or in round figures to 6 coil spaces.

This would bring the spacing of the loading coils for the cable to 1 mile per coil; half a mile from the switching station the first coil and the five others a mile apart from each other.

In the cable case the characteristic impedance would be

$$Z_o = \sqrt{\frac{\frac{0.2}{1}}{0.0714 \times 10^{-6}}}$$

$$= 1000 \sqrt{\frac{0.02}{0.0714}} = 1676 \text{ ohms,}$$

a remarkable coincidence with the impedance of the No. 8 circuits.

It appears that the characteristic impedance of loaded toll and long distance lines, cable as well as open wire, should preferably remain between the limits of 1,400 and 1,800 ohms; but when repeaters are inserted in such long circuits a reaction takes place on loading design. This will make the matching of impedance rather difficult, as velocity of wave propagation, cut-off frequency and cost must be taken in consideration, as we have seen in the previous paper on loaded phantom circuits, where the characteristic or nominal impedance in repeatered cables reached from 600 to 1,950.

### Loading Coils

Loading coils have a very interesting history. The first loading coils were of toroidal form and this form is still used today, but the core has passed through various changes. The first cores were formed by winding enameled iron wire of a fine gage into a ring, thus largely preventing Foucault currents and hysterisis losses. Soft iron was not suited for these cores, because in the first place it would not keep the permeability constant over the range of magnetizing force corresponding to the normal range of telephone currents. In the second place it would not avoid the "flutter effect." By flutter is understood the variation in permeability caused by superimposing telegraph and telephone currents in simultaneous telegraphy and telephony. The telegraph currents produce in the loading coil cores a superimposed magnetization, which causes the variation in the permeability loop. Therefore, harddrawn iron wire was selected for core material. This wire has the additional advantage, that hard iron keeps its permeability constant at the initial part of the magnetization curve. For this reason, loading coils must be designed that the magnetizing force corresponds to that of the initial part of the magnetization curves for the range of the speech currents. In Fig. 4 a loading coil of harddrawn wire for use in cable circuits is illustrated.

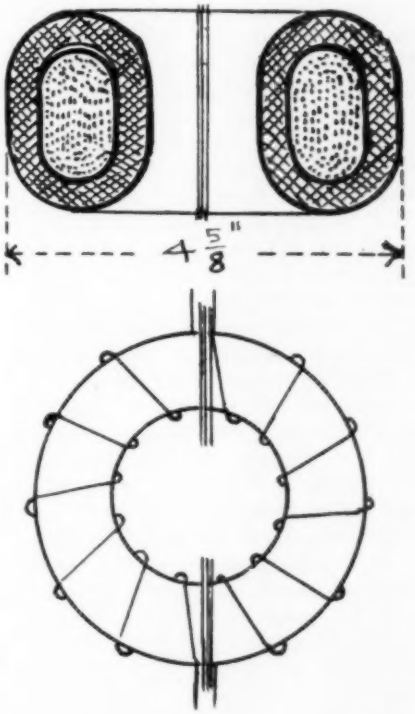


*Fig. 4—Wire Core Cable Loading Coil. Cross Section and Plan.*

When later on repeatered lines came into use it was found that the variations on the impedance of the lines caused by this kind of coils, although practically harmless in unrepeatered lines, were troublesome with repeater operation. To overcome this difficulty airgaps were cut into the cores of the iron wire loading coils at right angles to the path of magnetic flux. Soon, however, a material was developed which seemed to fulfill all requirements better than even the airgap wire cores, namely, compressed powdered iron.

To obtain powdered iron, the iron metal was deposited electrolytically on plates. After being deposited the pure iron was stripped off and ground to a fine dust. The grains of iron were given a coat of oxide and shellac and pressed into rings under an enormous pressure. The core was then built up of a number of rings.

These coils were of particular advantage in fine wire cables such as came into use for interoffice trunks. They were assembled in cases up to 300 coils in one case and placed in the manholes. These cases were filled with a moisture-proof compound and sealed, a stub cable protruding through the cover. The following table taken from Shaw and Fondiller's paper gives the electrical properties and dimensions of the iron powdered core coils for loading exchange area cables:

| Coil code No. | Inductance. Henrys. | Core permeability. | Resistance, ohms. D. C. | Resistance, ohms. 1,000 cycles. | Over-all dimensions, inches. Diameter. | Over-all dimensions, inches. Height. |
|---|---|---|---|---|---|---|
| 602 | 0.088 | 35 | 8.9 | 10.5 | 3.6 | 1.3 |
| 603 | 0.135 | 35 | 12.8 | 14.1 | 3.6 | 1.3 |
| 574 | 0.175 | 60 | 4.6 | 10.6 | 4.5 | 2.1 |

The No. 574 is the older type, the 602 and 603 were developed later. The effective resistance values are for a line current of 0.001 ampere.

The compressed powdered iron core

loading coils for long toll and long distance lines have the following properties and dimensions:

| Coil code No. | Inductance, Henrys. | Core permeability. | Resistance ohms. D. C. | Resistance ohms. 1,000 cycles. | Overall dimensions, inches. Diameter. | Overall dimensions, inches. Height. | Type of-circuit. |
|---|---|---|---|---|---|---|---|
| 562 | 0.250 | 60 | 11.4 | 25.8 | 4.5 | 2.1 | Side |
| 561 | 0.155 | 60 | 5.7 | 11.7 | 6.3 | 3.0 | Phantom |
| 564 | 0.175 | 60 | 6.6 | 15.4 | 4.5 | 2.1 | Side |
| 563 | 0.106 | 60 | 3.3 | 6.7 | 6.3 | 3.0 | Phantom |
| 582 | 0.250 | 35 | 15.9 | 21.8 | 4.7 | 2.4 | Side |
| 581 | 0.155 | 35 | 8.0 | 10.0 | 6.7 | 3.1 | Phantom |
| 584 | 0.175 | 35 | 10.8 | 14.1 | 4.7 | 2.4 | Side |
| 583 | 0.106 | 35 | 5.4 | 6.6 | 6.7 | 3.1 | Phantom |
| 584 | 0.175 | 35 | 12.1 | 15.3 | 4.7 | 2.4 | Side |
| 587 | 0.063 | 35 | 6.1 | 7.0 | 4.7 | 2.8 | Phantom |
| 590 | 0.044 | 35 | 4.0 | 4.6 | 4.7 | 2.4 | Side |
| 591 | 0.025 | 35 | 2.0 | 2.0 | 4.7 | 2.8 | Phantom |

NOTE—Resistance values apply to side circuits and phantom circuits of complete phantom groups. Effective resistance corresponds to 0.002 ampere line current.

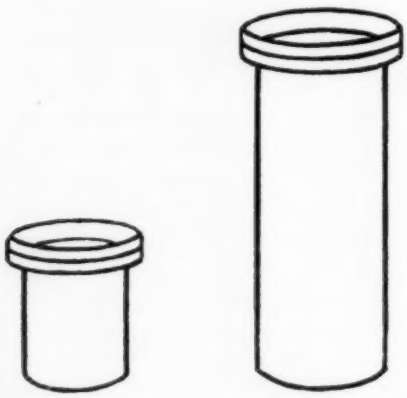

*Fig. 5—Permalloy and Iron Duct Core Loading Coil Cases for 200 Coils Each, Drawn to Same Scale.*

Recently an entirely new material for loading coils has been developed which has received the name "Permalloy." It is an alloy of 80 per cent nickel and 20 per cent iron, its magnetic properties are many times better than those of the best irons and steels. This metal has been employed already in the continuous loading of transatlantic telegraph cables by winding around them spirally permalloy wire or ribbon. For the use in loading coils the permalloy has to be specially prepared. It is powdered and heat treated. Permalloy core coils will be put in service on new construction. The difference in size between powdered iron and powdered permalloy cores is best illustrated in Fig. 5 where to the right a iscang to contain 200 iron dust core coils and to the left a casing to contain 200 permalloy core coils is shown. One will easily understand what it means in saving space in manholes.

## Community Telephone Company Purchases Illinois Central Telephone Company and National Telephone & Electric Company Properties

The Community Telephone Company, of 324 Bankers building, Chicago, Ill., has purchased the telephone properties located in Illinois and owned by the Illinois Central Telephone Company and the National Telephone & Electric Company, the transfer having been through the sale of more than ninety per cent of the common capital stock of both companies through Maurice F. Lennon of Joliet, Ill., to the Community Telephone Company.

The Community Telephone Company, of which C. D. Fisher is vice-president and general manager; James S. Engh, assistant to vice-president, and J. E. Byrne, treasurer, is a holding corporation controlling approximately 60 telephone exchanges located in the state of Illinois, Ohio, Minnesota and Wisconsin, these properties at present being operated under their several different corporations. Altogether, the company owns and operates 14 subsidiaries, serving a total of approximately 24,000 telephones, which, with the addition of the Illinois companies just acquired, will bring the total to over 38,000 telephones.

With the passing of controlling interest of Illinois Central Telephone Company and National Telephone & Electric Company, the following officers were elected: President, C. L. Fisher; vice-president, Edw. M. Fox; secretary-treasurer, J. E. Byrne; assistant secretary, James S. Engh, and assistant treasurer, D. A. Barnes, replacing those retiring, consisting in the case of the Illinois Central Telephone Company of L. C. Moeszinger, Clinton, Iowa, president; C. B. Cheadle, Joliet, Ill., vice president and general manager; A. P. Armington, Dixon, Ill., treasurer, and R. M. Matteson, Joliet, Ill., secretary and assistant general manager, and in the case of the National Telephone & Electrical Company, C. B. Cheadle, Joliet, Ill., president and general manager; L. C. Moeszinger, Clinton, Iowa, vice-president; R. M. Matteson, Joliet, Ill., secretary-treasurer and assistant general manager.

C. L. Fisher stated there would be no changes in the present operating personnel, with the exception of R. M. Matteson, who has been secretary and general manager for several years, who will become affiliated with the Community Telephone Company, in charge of operation; also, that it is the intention to remove the general offices, now located at Joliet, Ill., to some point in Illinois in which the companies are furnishing telephone service, thereby permitting closer contact between the operating forces and the public served.

It is understood that while Mr. Cheadle is retiring from official connections with these companies, he has not severed his connection with the telephone business. He is secretary-treasurer of the Tri-City Telephone Co., Clinton, Iowa, and secretary of the Dixon Home Telephone Co., Dixon, Ill.

Mr. Cheadle has been prominent in the Independent telephone field for many years. He has specialized in investigating, acquiring, organizing, reorganizing, building, rebuilding and developing run-down and poorly-managed telephone properties. That he has been successful in his work is testified by the fact that the two companies from which he has now retired have been considered as among the strongest of the Illinois Independent companies. These two properties comprise 25 exchanges with slightly over 14,000 subscribers.

Having first entered the Independent telephone field in 1898, Mr. Cheadle is known as one of the early Independent pioneers. He has taken active part in national and state conventions in the intervening years. In the Illinois Central Telephone Association he has served at times as president, secretary and general counsel, and has for many years been a director of the association.

## Bell System 1928 Budget

Philadelphia—Additions to plant and equipment of more than $420,000,000 are planned by the Bell System for 1928. This program is the largest in the history of the Bell System and is an increase of over $45,000,000 more than that of 1927.

Program includes over $41,000,000 for land and buildings, nearly $110,000,000 for central office equipment, over $91,000,000 for station equipment (telephone instruments, wires, and other apparatus at subscribers' premises), $110,000,000 for exchange lines and $65,000,000 for toll lines.

## Order to Sell Lorain Phone Plant Asked

Lorain, O.—The Lorain County Telephone Co. yesterday petitioned the state utilities commission for permission to sell its properties in Lorain to the Lorain Telephone Co.

Palmer, Neb.—Continental T. & T. Co. has bought Palmer Telo. Co.

Marion, O.—Ohio Associated Telo. Co. has bought Nevada Telo. Co. in Wyandot county.

# Practical Suggestions for Plant Valuation

By CHARLES W. McKAY, M. E.

CHAPTER X

Now we come to exchange and toll aerial cable—accounts 242 and 252, respectively. There are four items to be considered in connection with the determination of condition per cent of aerial cable. First, we must consider the condition of the suspension strand; second, we must carefully inspect the hangers, or cable rings, which are used to attach the cable to the strand; third, we must consider the condition of the sheath of the cable, and finally, but by no means least, we must make every possible effort to ascertain the actual condition of the copper conductor wires.

Quite naturally, the first three items—namely, cable strand; cable hangers, or rings, and the cable sheath must be conditioned by an actual inspection in the field. The last item, cable conductors, must be conditions largely through reference to the wire chief's trouble records and through instrument cable tests.

Now with respect to the strand—there is not much to say aside from the suggestions that have already been given with respect to anchor down-guys and pole line head guys. The same type of strand is usually employed—the size and tensile strength being dependent upon the strains imposed by the cable itself. In other words, cables of a given pair capacity and gauge, have a certain weight per foot, and the size and tensile strength of the strand will be accommodated thereto—in accordance with certain pre-determined tables.

If the strand is a good quality; properly installed, and well maintained—it will have a long life and show little evidence of physical deterrioration. If it is in poor condition—due to improper pole attachments; improper clamping of the three-bolt clamps or corrosion, it is well nigh useless and should be given a very low rating, accompanied by a recommendation for its replacement at the earliest possible date.

As to the hangers—marlin hangers are practically obsolete and it is only necessary to say that if marlin hangers are found, it is a pretty "safe bet" that they are very old and hence have a short expected future life. Therefore, the present condition per cent will be low.

As to ring hangers—rings may "creep," or become bunched, but this does not necessarily affect the present condition of the aerial cable plant. It is but a matter of maintenance to "ride the strand" and properly re-space the rings.

Modern cable rings are well galvanized; have a long expected life and the condition per cent will usually be found high.

Now as to the cable sheath—before the proper balance between lead, antimony, and other component elements entering into the manufacture of a cable sheath, was worked out by the manufacturers—what is known as "crystalization" frequently set in. Crystalization, as you well know, is a checking, or "opening of the pores" of a sheath, and, once it has started, it is most difficult to arrest its progress. Water gets into the cracks or fissures, in the sheath (in the winter time) freezes and expands, causing still further damage, and in the Spring and Summer months heavy rain-fall often causes an accumulation of moisture sufficient to penetrate the sheath—with the obvious result of wetting the insulation on the copper conductor wires and putting the cable out of service—at least temporarily. The remedy, of course, is to send a splicer out to cut away the damaged portion of the sheath; thoroughly "boil out" the moistened portion of the cable and then patch the sheath with what is known as a "service splice."

In the case of old cables, it is well to climb poles at frequent intervals and examine the sheath minutely for evidence of crystalization. Ofttimes a field engineer will note a number of service splices (from the ground) in a certain cable run—and quite naturally he will become suspicious. If he is on to his job, he will examine the cable most carefully for further evidences of crystalization.

The writer has seen cable sheaths which have been badly crystalized and subsequently the crystalization stopped by a certain asphaltum treatment. Needless to say, however, such a process involves the riding of every foot of the cable and is a very expensive maintenance gesture. So, generally speaking, the writer is of the opinion that the adage of "a chain being as strong as its weakest link" applies in the case of a crystalized cable sheath. In other words, if a sheath is pretty well "shot" through crystalization (or due to any other cause) it is far better to take the cable down and junk it—after, of course, it has been replaced either by another aerial cable or by an underground conduit system with cable, if the exigencies of the case in question seem to warrant such extreme measures (as the replacement by underground plant) due to growth in the number of subscribers' stations, or for some other good and logical reason.

Now we come to the working part of the cable—the paper insulated copper conductor wires. Quite naturally, we cannot rip open a working cable to examine the condition of the wires, and even if we could (except through instrument tests) we probably would not be able to find anything through an examination by the naked eye.

We must, therefore, fall back upon either the wire chief's trouble ticket records or actual instrument cable trouble tests. If the trouble ticket records shows a large number of cases of trouble, at various points along the cable, over an extended period of time, we are pretty safe in assuming that the cable is deteriorating, or "going bad"; that it should be replaced at an early date, and hence, accorded a low condition per cent. At this juncture, it may be well to remember that the junk value of cable is high, due to the value of the metals in the cable. We should be governed accordingly in putting the "low" condition per cent upon a defunct, or nearly defunct, aerial cable.

Now to sum up, with respect to the aerial cable—we should take all of the above mentioned four factors into consideration in arriving at the final determination of condition per cent. In other words, we should consider the condition of the cable strand; the supporting hangers or rings; the sheath and the cable proper—i.e., the paper insulated copper conductors.

In the April installment we will continue the subject of the determination of the actual present condition of a telephone property—through the medium of a field inspection—taking up a discussion of the aerial wire plant, exchange account 243 and toll account 253.

Next comes the subject of aerial wire—exchange account 243 and toll account 253.

Naturally, nowadays, aerial line wire is used almost exclusively for rural and toll purposes—cable used in the towns and cities for exchange distribution purposes. The use of cables, of course, is supplemented in the towns and cities by the use of insulated wire—for short stretches in the line and for service distribution drops to the subscriber's premises.

Let us first consider the question of de-

termining the present condition of bare line wire. Such line wire may be galvanized iron; of copper clad steel or of solid hard drawn copper wire.

Bare iron wire has a relatively short life in many communities—despite the galvanization—due to weather conditions. Furthermore, the salvage value is negligible—or, as a matter of fact, the salvage value may be termed "negative." In other words, it costs more to remove iron wire from plant than any possible scrap, or junk, value that could be assigned to it.

With respect to hard drawn copper wire, the life is long and the salvage value quite high, due to the fact that copper "junk" always has a high resale value.

The insulated wire may be of the so-called single "weather proof" type—or it may be of No. 17 insulated copper clad steel duplex wire.

There is little to be said about ways and means of determining the actual present condition of the aerial wire plant—aside from the general instructions that have been already referred to with respect to the exchange and toll pole line accounts and exchange and toll aerial cable accounts.

Of course, it is necessary to make an actual inspection to determine the condition as of the date of inventory and appraisement. Hard-drawn copper wire, unless it is very old, or unless it has been poorly maintained, will usually be found to be in good condition—due to the fact that it has a very long natural physical life.

Iron wire, of course, has a much shorter life, and in making the inspection especial attention should be given to corrosion and to "cracking" or "peeling" of the galvanized surface.

With respect to both iron and copper wire, especial attention should be given to all joints, or splices, and to the condition of the attachments to the insulators at the poles. In some cases these factors may not materially affect the actual condition for appraisal purposes—due to the fact that they may fall under the classification of "deferred maintenance." In other cases, where the plant has been allowed to deteriorate appreciably (with respect to these items of splices and insulation attachments—it is far better to junk the plant in question and replace it either with cable or with new wire, than to spend a large amount of money to cover the item of "deferred maintenance."

Covered or insulated wire should be inspected carefully to ascertain the exact present condition of the insulation. This is especially true in cases where the wire is strung through trees or subjected to unusual mechanical hazards.

Drop wires should be inspected—not only to ascertain the condition of the drop wire itself, but also to determine the condition of the attachment facilities at the subscribers' premises.

It is thought that these few suggestions will suffice to cover the subject of exchange aerial wire, account 243, and toll aerial wire, account 253—especially in view of the more detailed suggestions (with respect to the subject of a careful examination of plant) which have been incorporated in our consideration of the exchange pole and exchange aerial cable accounts.

The subject of the determination of the actual present condition of the outside plant of a telephone company will be continued in the May installment. In this article we will consider the underground plant—exchange underground conduit, account 244; toll underground conduit, account 254; exchange underground cable, account 243, and toll underground cable, account 253.

# *Texas, Banner Independent State, "Does Its Stuff"*

The outstanding points of interest of the four days' convention of the Texas Independent Telephone Association, held at Fort Worth March 20, 21, 22 and 23, were traffic improvement and better co-operation between operating companies, and there was not a dull moment from the time President R. B. Still of the Gulf States Telephone Co. of Tyler called the convention to order Tuesday afternoon until H. B. Whatley of Dallas finished his address at the traffic conference Thursday afternoon and the business session adjourned Friday noon after re-electing the old board of directors with the exception.

During the morning of the first day the directors held a meeting at which reports of the year's work were considered and plans for the coming year were discussed. At the same time Secretary L. S. Gardner of Waco and his assistants were busy registering members and visitors and exhibitors were getting their exhibits in place.

The meeting and exhibits were all on the top floor of the Texas Hotel and by the time the first meeting was called to order the entire floor presented a busy scene. Almost every conceivable piece of apparatus and equipment used in the telephone exchange could be seen.

Despite the fact that something like 100 small companies have been merged into three or four groups the past year or more, the attendance was up to that of former years, though actual membership had fallen off to some extent.

After the usual preliminaries in which Vice-President J. Y. Rust, manager of the San Angelo Telephone Co., reviewed the progress of the telephone industry from pioneer days to the present time,

*R. B. Still, President, Texas Independent Telephone Association*

President Still announced the appointment of committees and gave his annual address.

Reviewing the work of the association the past few years, President Still told how the organization had devoted itself to the cultivation of the spirit of co-operation between connecting companies, to defending the industry against harmful legislation and during the past two years to developing better traffic conditions and operating efficiency. He gave an account of the recent hearing before the Texas Highway Commission, at which it was decided that public utility companies might continue to use the highway under certain regulations of the department. The president advised the membership of the reasonableness of the ruling and suggested full co-operation with the engineers and officials of the department. In the matter of legislation Mr. Still referred to the efforts which will be made at the next session of the Texas legislature to enact a minimum wage scale and perhaps also to place telephone companies under the regulation of the railroad commission. In view of the fact that the consolidation of several companies into groups has resulted in decreasing the number of operating companies which are owned by persons within the state, the president urged the greater necessity of organization and co-operation among those remaining.

The other leading address of the afternoon was that of W. C. Grant of the Texas Information Bureau, in which he

showed how the public utilities of Texas are keeping their service before the public in a favorable light by giving the newspapers such information as their readers desired.

Among the discussions which featured other sessions of the convention were those of C. C. Deering of Des Moines, Iowa, secretary of the United States Independent Telephone Association; Frank L. McKinney, secretary of the Ohio Independent Telephone Association; Dr. C. L. Jones, president of the Ohio Independent Telephone Association, and Miss Anne Barnes, traveling chief operator, United States Independent Telephone Association, who were visitors. While Mr. Deering spoke on the value of organization, Dr. Jones on the benefits of state associations and Mr. McKinney on methods of treating legislative matters, the leading idea of all the talks was the necessity for closer relations between all operating companies and improvement in telephone service. Two of the speakers referred specifically to the consolidation of Independent companies and warned the industry that its only protection is in closer co-operation.

Traffic conferences were a prominent part of this meeting and there were, perhaps, a hundred or more traffic men and chief operators in attendance. All the larger companies and many of the smaller ones sent representatives. Practically this part of the program as published in the trade journals was carried out and the papers and addresses delivered were full of interest.

The Texas association has set a high record for entertainment at its conventions and this record was maintained. The principal events were the dance Wednesday night at the ball room of the Association of Commerce and the luncheon from 12:30 to 2:30 p. m., Thursday, in the banquet room of the Texas Hotel.

Officers re-elected were: R. B. Still, Gulf States Telephone Co., Tyler, president; L. S. Gardner, Texas Long Distance Telephone Co., Waco, secretary; D. J. Johsnon, Santa Anna Telephone Co., treasurer.

Vice-presidents re-elected were: F. W. Greber, Brownwood Telephone Co.; J. Y. Rust, San Angelo Telephone Co., and J. B. Earle, Texas Long Distance Telephone Co., Waco.

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### LOOKIN' AROUND AT THE TEXAS CONVENTION

Mrs. Valerie Blackwell, accountant Gulf States Tel. Co., Tyler, who doesn't mind telling how toll tickets should be made out.

Mr. Knelson of Everstick Anchor and Mr. Sheild of Cook Electric arguing over a display table. Two fine boys.

Hello, Wilson. The convention would not be complete without you. Been attending them since the flood.

And look yonder—J. B. Earle, of Waco, Texas. A charter member.

How's everything, Whatley? The big traffic engineer from S. W. Bell Tel. Co. of Dallas.

There goes Mrs. T. B. Bearden of Baird, Texas, lookin' after the husband.

Mighty attractive, Ruby Berry of Northern Texas Telephone Co., Denton.

As happy as a lark—Joe Knopp, demonstrating welding equipment.

President Still going to a committee meeting.

No wonder the boys are dressing up—Miss Johnson from Santa Anna.

Mr. Gardner Secretary and Mr. Stratton with Kelloggs talking things over.

Bob Wakefield — Wakefield Agency, Dallas.

Greetings, Mr. and Mrs. F. W. Greber.

Judge S. A. Lindsey of Tyler, Texas, attending his 100th convention.

Remember C. E. Gilmore, former telephone man at Wills Point, now chairman of Texas Railroad Commission, Austin, Texas.

Charles C. Deering, secretary United States Independent Tel. Assn., arm in arm with Frank Eldridge and G. W. Redormer entering the dining room.

Mr. and Mrs. Ledbetter and daughter Irene from Loraine.

Harry C. Wyche with International Creosoting Co., Galveston.

Yes, Mrs. Gardner, L. S., is talking to John Stratton.

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### North Dakota Holds Interesting Convention

North Dakota held its 22nd annual convention March 6, 7 and 8 at Devils Lake, some 200 were in attendance at the meeting, and unusual interest was shown from the beginning.

Officers elected for the coming year were: D. L. Vail, president, Minor; A. H. Bakden, vice-president, Mayville; F. R. Irons, secretary-treasurer, Starkweather.

In his annual address President A. T. Nicklawsky stressed the importance of district meetings and urged that more such meetings be held the coming year. Members were urged to solicit memberships from non-members.

As in many other conventions the use by telephone and power and light companies of highways came in for discussion as highway commissions are becoming more insistent upon the use of right-of-ways for traffic only. Telephone companies were urged to inform themselves on the use of highways by public utilities. It was explained that the laws of 1927, chapter 159, would define the rights of utilities.

A varied program afforded opportunity for any one interested in any branch of the industry to participate and absorb much that would prove valuable when applied in the proper way.

Reports indicated that the Independent industry was in a very satisfactory condition in North Dakota, and the attendance proved that interest was very much in evidence.

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### Indiana to Hold Convention May 9-10-11 at Indianapolis

Preparations for Indiana's big annual meet are going ahead with the idea that it is going to be the best in history, and when the Indiana bunch set their heads, you just naturally know they mean business.

So make your arrangements to attend this meeting, reserve rooms at the Claypool hotel and arrange to give your arm plenty of exercise, for all the old friends will be present.

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### Flowers for Christmas

Somewhere lost in the mails, but finally resurrected, we find this bit of cheering news for the telephone girls of an exchange down in Oklahoma noted for its very excellent service:

THE LEFLORE COUNTY SUN
Poteau, Oklahoma,
Jan. 3, 1928.

To the "Hello Girls":

I'm a bit late with this holiday cheer, but perhaps it will taste better now than then.

I got out of the habit of remembering the girls here because one didn't even dare ask the time, or where a fire was, or who called, for a long time, and I remarked more than once, that when the human side is taken out of business, it is a pretty cold proposition. The girls in places where I have been, would call me, and "tip off" accidents, and other news of value, not only to help make a good paper for the city, but to do a favor to me, and I always tried to reciprocate.

I just want to say that the sweet, cheery voices that have answered my call during the past year, still ring in my ears. Even if I have not expressed my appreciation before this, I want you to know I do appreciate it, and the good service you have given.

If there is anything I can do to assist you at any time, ring 177.

Happy New Year.

Chas. H. Cowles.

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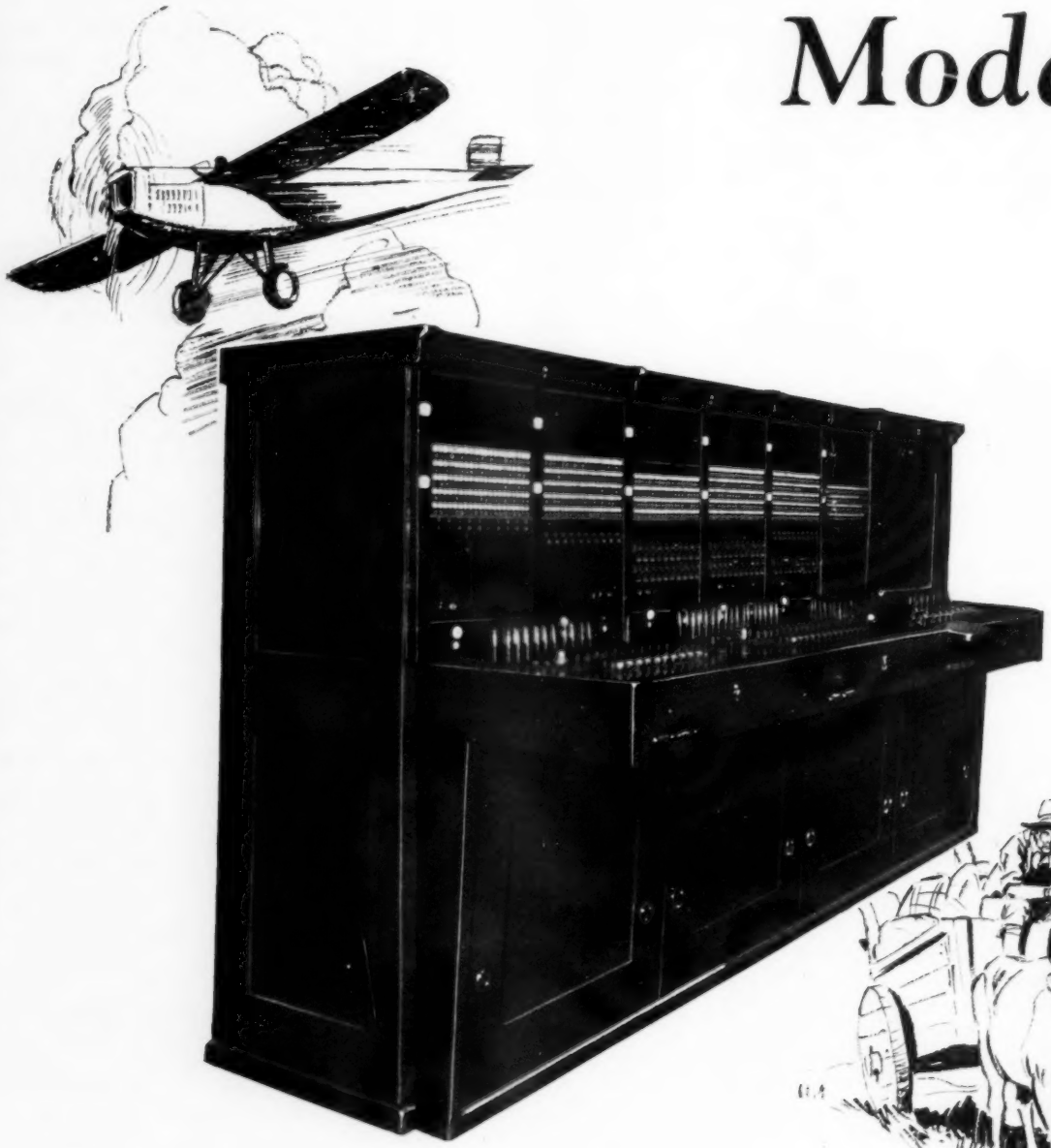
Little Rock, Ark.—Southwest Telo. Co. has bought Oklahoma telephone plants at Maniton, Texola, Loco, Randlett, Comanche, Hastings, Chattanooga, Wagoner, Morris, Grandfield, Temple, Devol, Purcell, Erick, Prague, Meeker, Wetumka, Harrah and Tecumseh.

# Moderni



*This illustration shows one of the new Junior Unit Type Convertible Boards recently installed for the Citizens Mutual Telephone Company at Cambridge, Ill.*

ermation

# The Spirit of the Age

COMMUNICATION is making the same rapid strides as transportation. There is a continuous demand for something better---for greater achievement in engineering design and construction.

American Electric Company, Inc., is meeting stride for stride the demand of the telephone operating executive for better and more efficient operating equipment.

Its latest development in switchboard design is the Junior Unit Type Convertible Switchboard. This board is similar to the large American Electric Unit Position Sectional Type board, having unit, low type, single operator position sections, and combining many other features long desired by the telephone operating man.

Each position is so arranged that additional sections may be added at any future time by removing either the right or left end panel and adding unit position sections as required.

**American Electric Company, Inc.**

**State and 64th Streets**
**Chicago, U. S. A.**

*Branch Office and Warehouse: 7th and Wyandotte Streets, Kansas City, Mo.*

# Studying Telephone Methods

By E. R. COLLINS

*Manitoba Telephone System, Brandon, Manitoba*

CHAPTER 15

## Cord Circuit Testing

There is an old question that "A chain is no stronger than its weakest link." This can be applied in many ways, but it is very true concerning the telephone systems. Large sums of money are expended to erect efficient lines and cable plants. Yet the efficiency of this apparatus can be offset by central office equipment in poor condition.

Possibly the cord circuit equipment causes more trouble than any other part of the central office plant. In many of the small magneto exchanges, cords and the keys and other apparatus associated with them are responsible for many cases of cut off and poor transmission, and delays in operation. Most of this trouble can be prevented by a little care.

It is a very rare thing to find any system whereby cords and keys can be quickly tested for trouble. It is our purpose in this chapter to discuss some methods of testing, as well as some of the peculiar features of different cord circuits. It is not our intention to follow out any complete cord circuit. These are so numerous that it would take several volumes to deal with them all. Rather let us pick out the part of a circuit that we wish to discuss, and forget about the rest of it. The practice of being able to separate the particular part of a complicated circuit, and dealing with it alone, will be found to be of great assistance in reading blue prints and locating troubles in central office apparatus.

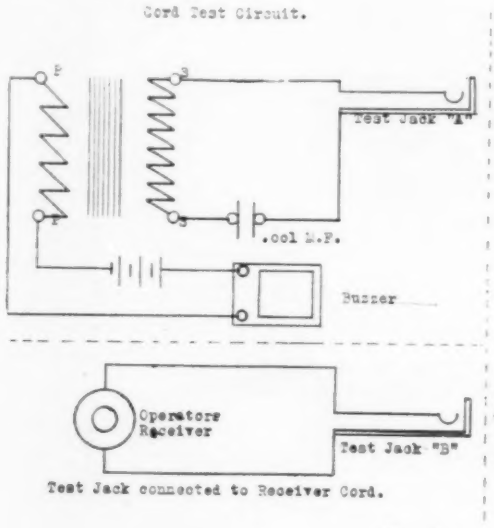



Fig. 114

## Cord Test Circuit

One of the first things to be looked for in a cord circuit is whether there are any breaks or high resistance points in the circuit. A tone of some description makes a good substitute for the human voice. In Fig. 114 the tone set consists of a buzzer, a battery, an induction coil and a small fixed condenser. The ordinary induction coil has a very low resistance primary winding through which the battery will operate the buzzer. The secondary induced current will be too loud for comfort when passed through a telephone receiver. Therefore we can either remove all but one layer of the secondary winding, and thus reduce the induced voltage. Or we can leave the coil in its original form and connect a small fixed radio condenser of .001 or .002 M. F. in series with the secondary. This is shown connected to jack "A." An operator's telephone receiver, with a switchboard jack soldered to the receiver cord, is shown connected to jack "B." The buzzer operation will send the tone from jack "A" over the cord circuit under test to the telephone receiver connected to the other cord of the circuit. Moving the plugs, or cords, or the keys will show up any trouble which would interrupt the voice frequencies.

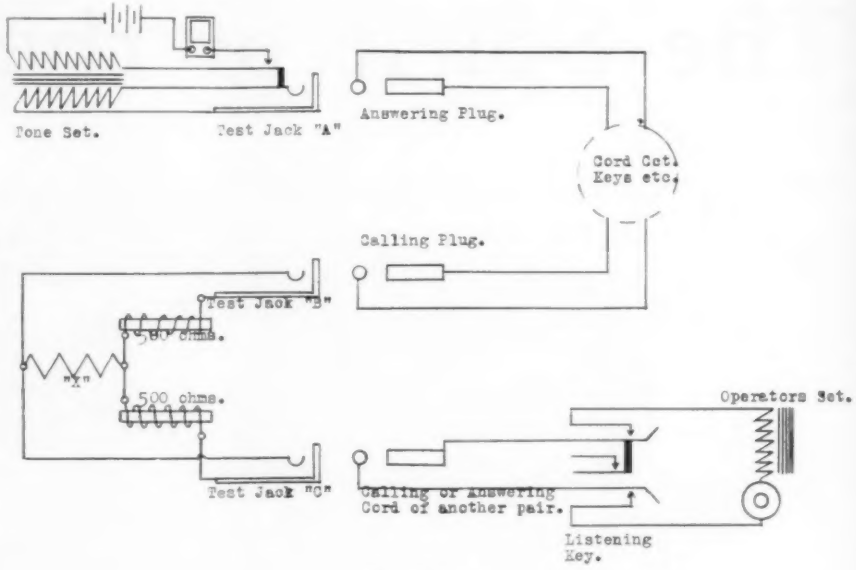



Fig. 115

Suppose there is a bad contact between two of the normal spring contacts, on the ringing side of the cord under test. This can easily be traced by touching a knife blade between the two springs when, if the trouble is there, a marked increase in the loudness of the tone will be noticed.

If a defective cord is found, of course change it. We will discuss some methods of repairing cords in the next chapter. In connection with Fig. 114 we have shown a condenser "C" connected across two of the normal spring contacts of the ringing key. When the ringing key is operated, this condenser will form a path between the two normal springs. Therefore while the ringing current is passing over the calling cord, to ring the telephone, there is sent back to the calling party a very small portion of the ringing current. This gives the calling subscriber a tone to tell that the telephone is being called. The value of this condenser will vary for the type of ringing current used. One about .005 M. F. should be satis-

factory. Some of the small radio fixed condensers can be tried until the desired loudness of tone is obtained.

A more complete cord test is shown on Fig. 115. Here jack "A" is equipped with an extra pair of springs, such as we find in a filament control jack of a radio set. When a switchboard plug is inserted in jack "A" the buzzer operates until the plug is removed.

Jacks "B" and "C" are connected together with a set of coils. These coils will cut down the loudness of the tone from the tone set. In testing for a cut out, therefore, connect the cord to be tested to jacks "A" and "B." Then take another plug and insert it in jack "C." This is shown connected to the operator's receiver by the regular switchboard key connected to the cord used. This makes it possible for the operator to test her cords regularly, without any extra equipment.

With such a cord test built into the switchboard, the operator can test all her cords each morning, as soon as she takes her place at a position. In this way any bad cords can be removed from annoying the subscribers. In Fig. 115 we have not shown the keys, etc., as this is not necessary.

The buzzer can be mounted in the back of the switchboard. If the method shown in Fig. 116 is used, there will be very

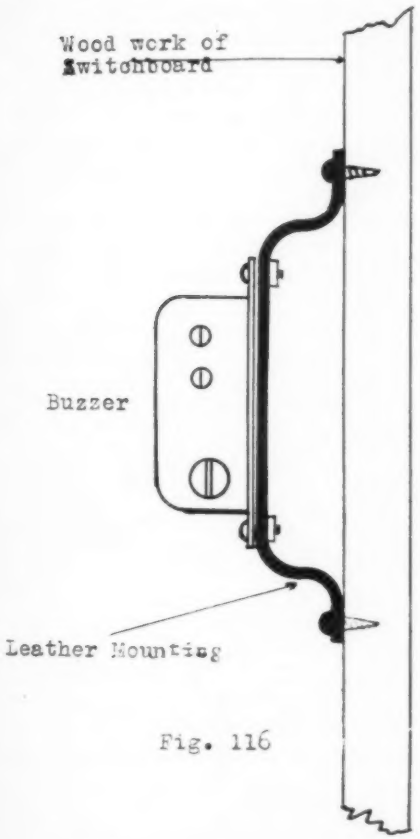



Fig. 116

little noise from the buzzer. If the metal cover is left off there will be less noise. The mounting consists of a piece of leather stiff enough to hold its shape. The adjusting screws should be mounted so that they can be reached easily.

### Supervisory Signal Test

The speed of the telephone service given can be increased if the supervisory or ring-off signals are kept in good shape. The coils connected between jacks "C" and "B" are for the purpose of testing the ring-off drops. The two coils marked

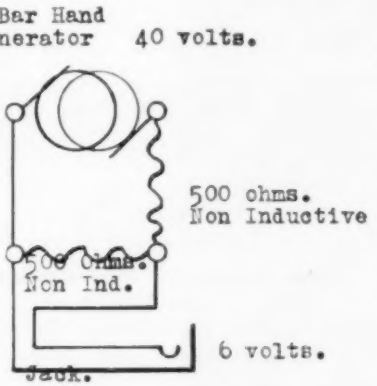



Fig. 116 "A"

500 ohms are coils such as are used in the ring-off drops. The coil "X" will have to be determined by experiment. We will give some values later which may be of some guide in choosing a coil. To test a ring-off, insert the calling plugs of two different cord circuits starting, say, with chords 1 and 2 in jacks "B" and "C." Pull the ringing key of cord No. 1 and the ringing current will pass through the two 500 ohm coils in series, through the ring-off drop of cord No. 2 and back over the tips of jacks "B" and "C" to cord No. 1. Coil "X" is for the purpose of further reducing the voltage applied to the ring-off signal of cord No. 2. Then test the other cords in succession, by connecting them to jack "C" in turn. The way the two coils are connected it makes no difference whether the ringing current be applied to jack "B" or jack "C."

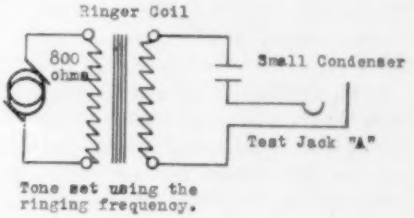
In Fig. 116 "A" we show an ordinary 3-bar hand generator. This will generate at an ordinary speed 40 volts. Two 500-ohm non-inductive coils are connected as shown in the drawing, and the output of the generator is connected to a jack mounted in the generator box. This can be used for a supervisory test by plugging into the jack, and ringing with the generator. When a 500-ohm ring-off signal is connected to the jack, the voltage across the terminals of the ring-off signal will be 6 or very close to this. This voltage will be found sufficient to operate the armature so that it will drop the shutter or bulls eye. The 5-bar generators used in rural sets will generate over 90 volts, so that we can count on considerably more than 6 volts to operate the signals. If all supervisory signals are made sensitive to 6 volts, there will be very little danger of failure to signal under ordinary operating conditions.

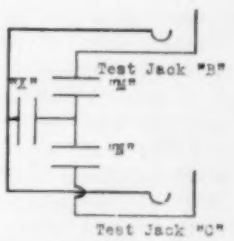
### Emergency Cord Test

An emergency cord tone test can be quickly connected up. Connect an ordinary 500 or 800 ohm ringer coil to the ringing machine. Wind about a dozen turns of any small insulated wire (a strand of jumper wire will do) around the ringer coil, and connect to a spare subscriber's line at the rack. Then obtain 3 ½ M. F. condensers such as used in rural telephones, and connect them at the rack to two more subscribers' jacks as shown in Fig. 117. Condensers "M," "N" and "X" may all be ½ M. F. Now if we apply 90 volts 16 cycle to jack "B," Fig. 117, the E. M. F. across the terminals of the ring-off signal connected to jack "C" will be about 6 volts.

If we had used 33 cycle current of 90 volts at "B" we would find a reading of approximately 15 volts across the terminals of the ring-off signal. This is as it should be, for we have already learned that the resistance of a condenser *decreases* as the frequency *increases*.

In Fig. 115 coils were used instead of condensers. The drop coils having iron

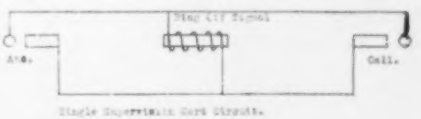



Method of wiring up an Emergency Cord Test.

Fig. 117

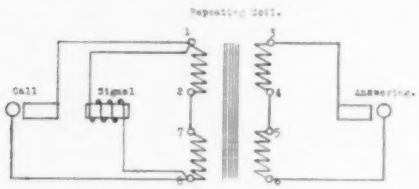
cores will have considerable inductance. The ringing current must pass through these coils to reach the ring-off signal. Suppose resistance "X" is 2000 ohms non-inductive. Then if we apply 16 cycle current at 90 volts to jack "B" the E. M. F. across the drop coil connected to jack "C" will be 10 volts. If 33 cycle current had been used at 90 volts pressure, the reading across the terminals of the drop



coil connected to jack "C" would be 6 volts. In this case we find that the higher frequency drops to 6 volts, while the lower frequency is 10 volts. This follows the laws learned, that the resistance of an inductance *increases* as the frequency *increases*. If "X" is about 1500 ohms, the E. M. F. for the 16 cycle will be 6 volts across the terminals of the drop coil.

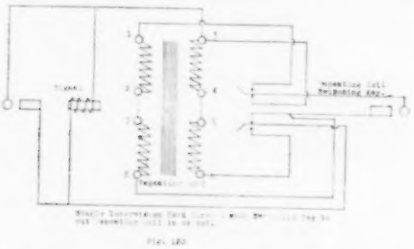
### Single Supervision Cord Circuits

There are two types of magneto cord circuits in general use. That is single and double supervision. In Fig. 118, suppose 90 volts were impressed across the answering cord from some source such as a telephone, then the voltage would be the same at all points along the circuit. This would mean that if the ringing current came from the answering cord subscriber, the ring-off signal would operate and the telephone connected to the calling cord would also ring. The same would be true if the ring came from the opposite direction. The signal is therefore common to either telephone connected.

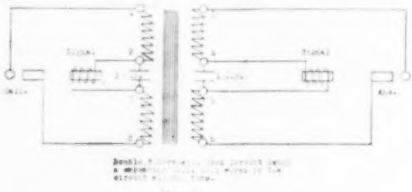



Single Supervision Cord Circuit using Repeating Coil.
Fig. 119

In Fig. 119 is shown another type of single supervision cord circuit. The repeating coil is connected so that an unbalanced line connected to one cord will not unbalance the other line connected. In this case if 90 volts 16 cycle were connected to the answering cord, the voltage would drop to 67 across terminals 3 and 6 of the repeating coil. The voltage across terminals 1 and 8 would drop to 65, and therefore the ring-off signal would have 65 volts across its terminals. If the ringing current came from the calling cord, the voltage would be about 67 across the ring-off signal. The ringing voltage applied to the ring-off signal in this case is about the same no matter which telephone rings. The one telephone can still ring the other, although the ringing voltage will be considerably lower on account of the repeating coil. This, therefore, is a single supervision cord circuit.



In Fig. 120 is shown the same arrangement as in Fig. 119. There has been added a switching key to cut the repeating in or out of the circuit as may be desired. There is very little advantage in using this key. In fact it is often a source of trouble. Locating a trouble on a cord circuit where repeating coils are used is very easy with the tone method. Very little difference will be noticed with the tone, when the coil is in circuit or out of it. Where conductors are used in the talking circuits, the tone method is very effective.



### Double Supervision Cord Circuits

In Fig. 121 is shown another type of circuit known as a double supervision circuit. There are two ring-off signals, and they are connected across terminals 2 & 7 and 4 & 5. In Figs. 119 and 120 they were connected across the outside terminals of the repeating coils, and the inner terminals were strapped, or connected together.

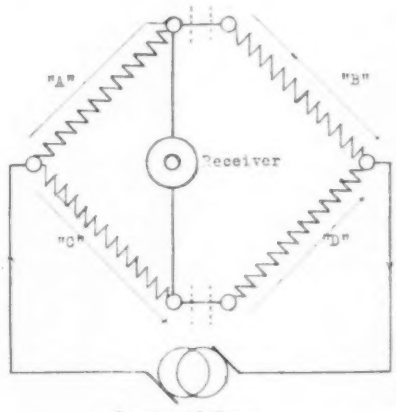
Condensers are connected across the inner terminals of the repeating coil shown in Fig. 121. If this were not done, the talking frequencies would have to pass through the drop coil. But this is very high impedance, and would block the voice frequencies. A condenser is bridged across these two points and the condenser resistance lowers with the higher frequencies. Therefore the voice frequencies will find an easy path through the condensers.

In Chapter 10, November, 1927, we discussed the effect of a transformer or repeating coil in a circuit. We learned that the impedance of the primary lowered according to the load on the secondary. Therefore although sections 1-2 and 7-8 of the repeating coil Fig. 121 have of themselves high impedance, the fact that their fields are interlinked with sections 3-4 and 5-6 causes their impedance to vary with the loads across the terminals 3 and 6. The ring-off signal of course is not included in this magnetic interlinking, therefore the condensers must be provided to overcome their high impedance. Now if we were to apply a 90 volt 16 cycle ringing current to the calling cord, from some outside source, then the voltage across 1 and 8 will drop to 80, while across 2 and 7 the E. M. F. will be 50 volts. Therefore drop signal connected to 2-7 will have 50 volts across its terminals.

At the same time the pressure across 3 and 6 would be 3 volts, while across 4 and 5 there would only be a reading of 2 volts. The 2 volts will be too low to operate the answering cord signal, and the voltage across 3 and 6 would not be sufficient to ring the bells of the line connected to the answering cord. The above readings were taken with a ½ M. F. condenser connected across the center terminals of the repeating coil. With a 1 M. F. condenser the results are better. A 90 volt ringing current will show 85 volts across 1 & 8, 53 volts across 2 & 7, and across terminals 3 & 6 the reading is 3 volts, while across 4 & 5 there is only 1 volt. This produces the desired result of two separate ring-off signals, and no ringing through from the calling to the answering telephones. The talking efficiency of the circuit is better than the 1 M. F. condensers. Increasing the capacity of the condensers above this value does not increase the talking efficiency of the circuit to any great degree.

### Condenser Coupling of Cords

Another method of connecting cords is to use condensers as shown in Fig. 122. Here we have two ring-off signals. If we apply 90 volts to the calling cord of this circuit the reading across the answering cord will be between 1 and 5 volts. The incoming voltage from a rural line would be considerably below 90 volts, so that the one signal alone would operate. We have here a very cheap type of double supervision cord circuit, and quite efficient as far as supervision is concerned. It has a little more loss than the transformer method, but is considered good enough for local telephone service. It




Method of testing for unequal Capacities.
Fig. 123

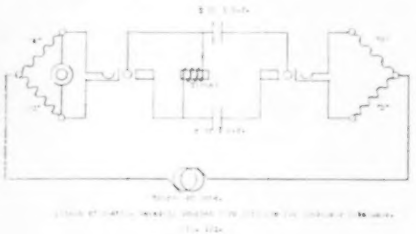
had, however, one bad fault. It is a very difficult matter to obtain two condensers of the same value. Therefore if we have unequal condensers, and have two long lines connected, the lines will be noisy.

This was illustrated in Figs. 83, 84 and 85 of the December issue, Chapter XI.

### Testing Condensers for Unbalance

In Fig. 123 we illustrate the Wheatstone bridge principle. If we have four equal resistances, "A," "B," "C", and "D" connected as shown and send a tone as shown by the arrows. Then if the four coils are absolutely balanced, and a telephone receiver connected as shown, there would be little or no tone heard in the receiver.

Now if two equal condensers were connected as shown by the dotted lines, we would still have little or no tone. Suppose one condenser is ½ M. F. and the other is 1 M. F. Then we would hear the tone in the receiver quite loud. The four coils are non-inductive of course. The flat mica type used in common battery exchanges, or the small spools used in Strowger automatic equipment, will fill the bill nicely.



This can be made up into a test set as shown in Fig. 124. Here we have the cord circuit connected in place of the condensers shown in Fig. 123. If your switchboard is equipped with this type of cord circuit, and bad cases of condenser unbalance can be detected by using this test, the two ring-off signals will make no difference to the results obtained. Any cord circuit that shows a louder tone than the rest will cause noise when in actual use on long lines. In replacing the condensers with new ones, test the new ones as shown in Fig. 123, before soldering them into their place in the switchboard.

For good transmission the values of these condensers should not be below 1 M. F.

### Routine Tests

The above tests are all quite simple, and the expense of wiring them into the board is small. The operators can be trained to test the cords daily for cut out and supervision. Sideplay in the keys can also be detected. To test for sideplay in the ringing key, insert the calling cord into jack "B" or "C." Pull the ringing key associated with the cord, and while ringing move the handle sideways if possible. The generator tell tale will show up any poor ringing contact. Then by placing a cord in jack "A," Fig. 115, the tone is turned on. Open the listening key, and listen for any cut-off when the listening key handle is moved sideways.

Another routine that is very important is to clean the plugs. A cake of Bon Ami and a damp cloth will do this very nicely. Dirty plugs are a very prevalent cause of fading or cutting out.

### Types of Repeating Coils

The numbering shown for the repeating coils in this article are taken from a Kellogg No. 17 type repeating coil. In the following table are shown 3 other types and the relation of their numbering to the Kellogg coils:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Kellogg Coil.... | 3 | 4 | 5 | 6 | 1 | 2 | 7 | 8 |
| Century Coil..... | 8 | 7 | 6 | 5 | 1 | 2 | 3 | 4 |
| Western Electric. | 4 | 3 | 8 | 7 | 2 | 1 | 6 | 5 |
| Northern Electric. | 4 | 3 | 8 | 7 | 2 | 1 | 6 | 5 |

# *Oklahoma Convention Smashes All Records in Attendance*

The most successful annual convention of the Oklahoma Utilities Association was held at the Mayo Hotel, Tulsa, March 13, 14 and 15. The attendance broke all former records with a registration of 975. Many speakers of national reputation in the industry were on the program. General sessions were held during the forenoons, and each of the divisions—gas, electric light and power, telephone, manufacturers and suppliers and public relations—held meetings in the afternoons. The telephone division, however, met morning and afternoons with the exception of the forenoon of the first day.

Principal entertainment features were the annual reception and ball on Tuesday night and the annual banquet and entertainment Wednesday night. On the latter occasion Hon. Charles A. Eaton, of North Plainfield, N. J., member of congress from that state, delivered the principal address. He talked on the movement in congress to put the U. S. government into the light and power business. He warned of the dangers of introducing soviet ideas into the American system of private initiative and private management of all business which can be successfully conducted by the individual.

*L. W. Scherer, Newly Elected President of the Oklahoma Utilities Association*

A most interesting feature of the convention was the musical program and amplifying service installed by L. W. Scherer, president, and E. L. Potts, engineer of the United Telephone Corporation of Yale, Okla., with the cooperation of Stromberg-Carlson Telephone Manufacturing Company, Kellogg Switchboard and Supply Company and Southwestern Bell Telephone Company. The equipment was connected to loud speakers in all convention rooms and on the exhibit and main lobby floors. This equipment was used for entertainment and announcements before opening of sessions and also through a hook-up with long distance lines of the Southwestern Bell Telephone Company it was used to transmit the "greetings" of Governor Henry S. Johnston from his office in Oklahoma City to the delegates in the main convention room. The equipment was also arranged so that the governor plainly heard the applause and the response to his address delivered by E. R. Ernsberger, of Oklahoma City, retiring president.

The telephone and other divisions will cooperate in creation of a safety and claims committee of the association to promote greater safety in connection with construction and operation of public utility properties.

Among men of national prominence who addressed the convention were: J. W. Welsh, New York, general secretary of the American Electric Railway Association; J. F. Owens, Oklahoma City, chairman public relations national section, National Electric Light Association; C. C. Deering, Chicago, secretary United States Independent Telephone association; Alexander Forward, New York, managing director American Gas Association; W. S. Vivian, Chicago, director public relations, Middle West Utilities Company; E. K. Hall, New York, vice-president, American Telephone and Telegraph Company; H. S. Bennion, New York, director of engineering, National Electric Light Association, and Miss Anne Barnes, Des Moines, traveling supervisor, Iowa Telephone Association.

E. K. Hall of New York, vice-president of the American Telephone and Telegraph Company, addressing the Wednesday general session, declared that public utilities have reached a state of prosperity through giving good service and

maintaining the good will of the public. He declared that it is necessary for utilities to hold their present prosperous condition in order that they may have revenues to enable them to maintain good service. He urged all utilities to keep out of politics, and to play fair with the utility commissions. He warned utilities against over playing their hands during these days of prosperity, and urged them to keep steady in the boat and pursue honest and conservative policies. He urged utility companies to beware of exploiters from the outside, who care nothing for the success of the utilities or the customers they serve and who would, if given an opportunity, sell spurious stocks to the public. Eternal vigilance must be exercised to keep the unscrupulous financiers out of industry.

An address on "Sound Telephone Accounting" was delivered in the general session by R. J. Benzel, general manager for Oklahoma, of the Southwestern Bell Telephone Company. Mr. Benzel is one of the most expert authorities on utility accounting in the southwest, especially qualifying in telephone accounting.

Attendance of telephone people broke all former records with approximately 150 present. L. W. Scherer of Yale, chairman of the division, presided. The resolutions adopted during the business session of the association, in which all divisions participated, extended thanks to Mr. Scherer, E. L. Potts, chief engineer of his company, Stromberg-Carlson Telephone Manufacturing Company, Kellogg Switchboard and Supply Company, Southwestern Bell Telephone Company and the Jenkins Music Company of Tulsa for the musical programs which were presented through special amplifying equipment. The resolutions stated that Mr. Scherer deserved special commendation for a week of hard work in arranging and installing the amplifying and program equipment in the convention rooms.

H. W. Hubenthal, secretary and telephone engineer, acted as secretary of the telephone division sessions. He also delivered a report on accomplishments of the telephone division during the past year, which is reviewed in another column of this publication.

Geo. M. Kloidy, secretary of the Nebraska Telephone association, talked on the subject "Co-operation in the Telephone Industry." He stated that at conventions, "experience meets experience, ideas and methods are exchanged and we learn how others have solved the different problems. Leaders of the industry are usually present and they point the way and teach us the fundamentals of our business. It is here we meet the manufacturers and jobbers of telephone supplies and learn of newest things in telephony." He declared that the lover of romance and adventure will not find in the passages of fiction any narrative to surpass in breathless interest and astounding revelations the history of the telephone.

J. W. Walton, Hominy, Okla., president, Oklahoma Telephone company, talked on "Service." He advised the telephone people to furnish good service at all times, if they hope to get good rates and secure the good will of the people.

W. S. Vivian of Chicago addressed the telephone division along lines similar to his talk in the general session.

Judge W. L. Crittenden, field representative, Oklahoma Utilities Association, related his experiences connected with his recent trip through Europe and other foreign countries and calling special attention to high installation charges and poor service, which obtain almost universally in foreign countries where the telephone industry is owned and operated by the government.

A very able paper was presented by I. H. Nakdimen, president of the Citizens National bank, Fort Smith, Arkansas, and secretary-treasurer of the Oklahoma-Arkansas Telephone company. He spoke on the subject "Public Relations from a Banker's Viewpoint." He stated that public relations departments are not exclusive with utilities, but that banks and other institutions also have such departments. He declared that rates of all utilities must be fair and equitable. He warned, however, against fights in the courts to secure higher rates, stating that these rate controversies create enemies and bring about strife, dissatisfaction, disorganization and a general bad feeling in the community.

Joe Nelson of Perkins, Okla., manager of the Perkins Telephone company, talked on "Rural Switching Service Problems." His talk aroused so much interest that the telephone division adopted resolutions providing for creating a committee in the Association to take concerted action looking toward more remunerative switching service rates.

Former State Senator, Harry Cordell, president of the Oklahoma State Board of Agriculture, talked on the good service given by the telephone companies, especially in rural districts.

A greeting from the telephone people of the United States was brought to the telephone people of Oklahoma by C. C. Deering of Chicago, secretary of the United States Independent Telephone association. Speaking in the telephone division, he commented favorably on its action, relative to switching service. He urged all telephone companies to join the state and national associations of their industries. Through such organizations the companies can bring about better operating conditions, he said. Many things are done by these associations, which benefit non-members as well as members, Mr. Deering pointed out, and he urged all non-members to join and bear their pro-rata part of the cost of maintaining the service these organizations give.

A demonstration on radio program service and equipment was given by E. L. Potts, chief engineer, and L. W. Scherer, president, United Telephone corporation.

"Telephone Service at the Cross Roads" was the subject of an address by Miss Anne Barnes, traveling supervisor, Iowa Telephone association, Des Moines, Iowa. Miss Barnes stated that her message did not deal with the technical part of the work, but had to do with the manner in which the telephone operator sells to the public her product, which is telephone service. "Sometimes we get our most helpful lessons by the successes and failures of others," said Miss Barnes, "and so instead of talking telephone entirely, I am going to give you a few observations I have made on both the operator and fellow townsmen of hers." She then related numerous incidents connected with the small town business life to illustrate the necessity of giving careful, intelligent and courteous attention to the needs of patrons, if success and good will is to be obtained.

The following officers were elected in the general business meeting to serve the Oklahoma Utilities association for the ensuing year:

President, L. W. Scherer of Yale, succeeding E. R. Ernsberger, Oklahoma City; First Vice President, H. L. Montgomery, Bartlesville, succeeding L. W. Scherer; Second Vice President, T. H. Steffens, Sand Springs, succeeding Mr. Montgomery; Treasurer, W. R. Emerson, Oklahoma City, and Manager, E. F. McKay, Oklahoma City.

## STROLLING ALONG AT OKLAHOMA CONVENTION

Hi there, Frank Eldridge, how's Carbon Products?

And look who's here—A. A. Cronk, formerly with Stromberg-Carlson, now a resident of Tulsa. Has a hankering to secure an exchange and get back into the game.

Busy as a cranberry merchant—Mr. E. R. Ernsberger, president, Oklahoma Utilities Association.

A regular fellow—Jack H. Stratton, demonstrating Automatic Electric Co. Equipment. Knows his stuff, too.

Congratulation—President Scherer.

Young Redormer, pinch-hitting for his dad both for the Reliable Electric and on the golf course. Pretty good at both, they say.

And in his usual good humor—H. W. Hubenthal, telephone engineer, Oklahoma Utilities Association.

On the job as usual—R. D. McGuffey of the American Electric Co.

Marshall L. Smith of the Tulsa World. Nice publicity you gave us, Smith.

As active as ever—E. F. McKay, manager Oklahoma Utilities Assn.

Did you ever get a room, Sartain?

# LINE AND DESK

## A POWER INTERFERENCE PROBLEM

A subscriber in a northern state has the following problem, which he submits:

"We have a grounded toll line, also a grounded farm line which runs out about six miles. A power company has built a 6,600-volt farm line to feed light and power, and their lines parallel our lines, which makes them almost useless. I had in mind to make the farm line metallic by using the grounded toll line, and then put in some repeater coils at the switchboard, also at the end of metallic farm line, and then continue with the grounded toll line. Will this work out? and if so, kindly advise us just what is necessary in the way of repeater coils, and other apparatus necessary to make this change in order to make the farm line metallic, and yet operate the toll line grounded. I thought that by being able to use the toll line wire we would save the running of about six miles of wire, and in place of it buy repeater coils.

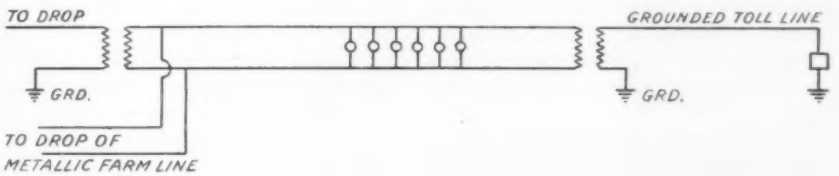



*Fig. 1—Subscriber's Suggestion, Which Will Not Work, as Circuits Will Ring and Talk Together*

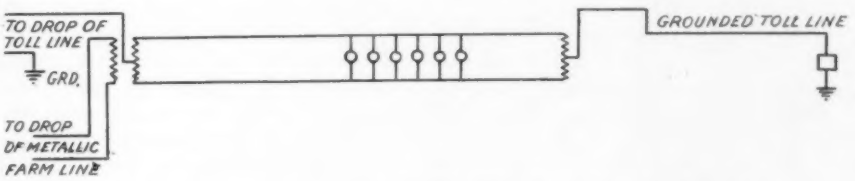



*Fig. 2—Simpler Arrangement Which Will Keep Circuits Separate*

The sketch submitted by the querist is shown in Fig. 1. It is obvious that it will not work as he suggests, because the toll and farm line ringing and talking current will both pass over the same circuit in the metallic portion of the line. The result will be that only one circuit could be in use at a time. One way or separating the two circuits would be the use of repeating coils as shown in Fig. 2. The arrangement makes a metallic circuit for the farm line but leaves the toll line working on a grounded circuit. The farm line would be quiet, but the toll line will be as noisy as the present grounded circuit. There is no known way of securing two metallic circuits from two wires. The best that can be done is to secure one metallic and one grounded circuit. Of course, three circuits can be made from four wires by the ordinary phantom arrangement. Any telephone manufacturer can supply phantom repeating coils which will be satisfactory for the circuit arrangement shown or for the regular phantom circuit.

## SERVICE CONTINUES DURING CENTRAL OFFICE MOVE

It sounds like considerable of an undertaking to move a large brick city building without interfering in any way with water, sewer, gas, light or telephone service. It's even more of an undertaking when the building is a telephone central office, and during the moving, telephone service continues throughout the city the same as if nothing were taking place.

This is what occurred recently in Kansas City, Mo., when the Jackson central office building of that city was moved about thirty feet, fifteen feet in one direction and fifteen feet at right angles, due to the contemplated widening of Seventy-first Street Boulevard. The Jackson central office serves 4,448 subscribers' telephones, and throughout the entire time the building was being moved telephone service was continued as usual and long distance conversations were carried on with places as far remote as Dallas, Tex. —*Bell Telephone News.*

## ANOTHER PUSH BUTTON RINGING QUERY

Mr. F. A. Rogerson of Blyth, Ont., asks a question relative to use of three and five point buttons on circuits arranged for silent call to central:

In an interesting article by E. R. Collins on Details of Telephone Work, in January TELEPHONE ENGINEER I wish to get a little information.

Hydro electric power lines have come into this section paralleling our telephone lines, making them very noisy by inductive interference.

Now I know the lines are out of balance, not having proper transpositions, etc. I propose making transpositions and putting in retardation coils.

Now what I want to know is this—having a three-spring push button, is it necessary to put in a five-spring button to make a balance? In either button it is open until used, is it not?

Why I ask is that I heard a man make a statement at a convention that it was no use putting in retardation coils unless you put in five-spring push buttons. I can put in retardation coils and the transpositions easily, but it is a lot of work to change buttons.

What resistance should coils be? An answer will be gladly received.

The query was referred to Mr. E. R. Collins, author of the article mentioned. Mr. Collins' reply follows:

"The push button has no connection with the talking balance of your lines. The five spring button will be necessary to give you the selective ringing feature of the push button system.

"If the three spring button is used in connection with the retardation coil, you have established a condition similar to a ground on a push button line. The bells will ring to a certain degree when the button is used. To overcome this the five spring button is used.

"The Northern Electric Co. supply a push button known as the N-1-A, which is mounted on a plate similar to the three spring button. The new buttons should be installed for a complete line before the coil at the exchange is connected.

"The retardation coil used is 500 ohms to a side. The Northern Electric Co. make two types with the same resistance. The 46 P is 500 ohms to a side, but is intended to be screwed to a board with wood screws. The 47 P is intended to be

mounted on a No. 600-A mounting plate drilled for 10 coils. Where several coils are to be used, this is the most compact mounting. The mounting plate mounts on a frame with holes 18¾ ins. centers.

"A feature of this system is that the line drop is always connected to the line, and a ring-off signal will be received with the push button operating the line drop, or operating the cord signal when a straight ring is given on the line. The use of the 5 spring button and the retardation coil, makes an ideal system, but is not satisfactory unless the buttons are changed."

## THE WIRE KITE STRING HAZARD

The following item from Bell Telephone News recalls an item of similar nature from an Indiana town. A railroad brakeman riding on top of a car was seriously injured by coming into contact with a wire kite string which was entangled with the wires of a high tension electric circuit which crossed the railroad tracks. The use of wire strings creates a hazard not only for the children flying the kites but for others as well.

"Another bad hazard was uncovered in connection with the building of radio sets, when it was learned that several children have been seriously injured lately while flying kites with a wire "string." You builders of radio sets should be very careful not to leave any of these spools of wire around where the children might get hold of them, as this wire is very tempting for kite flying. It is light and very strong, and when used for this purpose, it creates a most dangerous hazard as it flies over numerous power lines. We all know from our childhood experiences how often the kites fall to the ground, and even though the wire is very small, it is possible for it to convey enough current, should it fall across a power line, to electrocute the one who is holding the other end. Only recently a fourteen-year-old girl at Ashland, Wis., was seriously burned in this same way. The *Milwaukee Journal* says of this case: "The current passed in at her jaw and out at her feet. Both the jaw and feet were severely burned. She was rushed to the hospital, where an operation was performed. Current over the city was discontinued for half an hour." So you see, even though small, this wire, if left lying around when you are building your radio set, might be the means of causing a death. Leave no such things loose. Gather them up and put them in a safe place, or destroy them, and see that no one uses this wire for flying his kite.

## WHAT IS THERE IN MY JOB?

Sometimes I think it will take more than a tornado to shake up an interest in some of us. And yet, the romance of it all—the tremendous progress the business has made over a comparatively short space of time—the vital necessity it has become in the life of all business—these and many more are reasons why the simple words "Telephone," written or spoken, should stir up in all telephone people an alert interest.

"All very well," you say, "and all very true. And its fine talk-talk. But what about my job? Maybe I'm a cable splicer's helper—boiling paraffin and heating metal or singing the sad song of 'on the odd' on a big main frame to the tedious tune of the splicer's buzzer as he picks his pairs in a long 'nine-hundred.' Find me a nice lively interest in that, if you please."

Why, that's easy. You've found your place in one of the greatest phases of the business. Your next step is to be a cable splicer yourself. And cable splicing is an art. Can it be that you're not interested in finding out what it's all about? Can you watch the splicer down in the manhole with a great bushy mass of wires before him—thousands of them—swiftly and carefully, pair by pair, bring each tiny wire to its destined mate until he has a beautiful and compact splice ready for the paraffin and the sheath—can you watch this tangled mass of wires smoothed out in this workman-like manner without feeling a thrill that one of these days that will be your job? Can't you even catch a glimpse of the part you are playing in this particular job? The help you rendered in checking the cable? Was it always help? Or, by your listlessness or carelessness or thoughtlessness, did you sometimes hinder more than help? Was the paraffin just right for the boil-out?

And then, in a larger sense, have you a picture of the tremendous part that cable plays throughout the telephone system? Like many other phases of the telephone job, it is a romance in itself. It has progressed so that urgent requirements for the increase of business could be met and likewise the telephone business has progressed, automatically, to meet the improved facilities which persistent research has produced.

From the first crude cable back in 1882 up to the present day with our New York-Chicago cable and our Havana cable, there is a long and interesting story. A story of cables soaked in oil—of the use of iron pipe, asphalt, concrete, tar, and boxes of sand.

And you ask me if I could find anything interesting in your job.

Do you know how cable wires came to be wrapped in paper? Originally they were wrapped in cotton. It was too expensive—so a substitute had to be found. One of the men on the job, a Virginian, happened to recall that, during the War Between the States, paper twine had been used. A barrel of this paper twine was finally located in Richmond; but they couldn't find a way to put it on the wires so that it would stay.

At last, a man was heard of who had invented a machine for wrapping tape on bonnet wire and this hint was all that was needed.

Just such incidents as this have made possible our marvelous cables of today.

For example, the New York-Chicago cable, 861 miles long—partly underground—partly overhead, the longest cable in the world. It took seven years to build it and twenty-five million dollars to pay for it. It has the circuit capacity of ten heavily loaded open wire pole lines, more than 250 telephone circuits—and can carry 500 telegraph messages simultaneously with the telephone messages.

Really, now, isn't there something interesting about cables?

What is true of cables is just as true of all the other phases of the job. Tremendous strides and improvements have been made in the past and are being made today. Opportunities just fall all over themselves reaching out to us. The Bell System stands out prominently for its efforts to develop its people, to give them all the training they will take, to give them all the knowledge about the business that they want. And I don't believe there is any place in the whole realm of industry where success is more sure to the worker with a deep and abiding interest in his work than right here in our own company. We should not only be interested in the job—we should be "all het up" about it.—R. H. Davidson in *The Transmitter*.

## AN ECONOMICAL REFINISH FOR METAL BOX TELEPHONES

Of especial importance to those with telephones in service of the metal cabinet type is a little painting scheme we have used, finding it both economical and highly satisfactory. Whenever we bring a telephone in for repair and parts replacement and it looks the least bit worn and scarred, we remove the gongs, completely cover the transmitter, or better yet, remove it, and spray the instrument, so to speak. There is an inexpensive spraying machine of the pump variety on the market for painting purposes, costing only $1.50. Black lacquer is used in the sprayer and it puts a perfectly even finish on the instrument. There is no trace of paint brush hairs or streaks ordinarily left by the willing but necessarily amateurish repairman painter.

We have even gone so far as to paint all relay covers and iron parts since it stops rusting tendencies and gives a clean, new appearance of the recently adopted dull finish. Another favorable factor is that the lacquer dries quickly and it is absolutely not sticky. Try it and you won't be sorry.

Contributed by Ernest Wommack

# The Wood of a Cedar Pole

By J. P. WENTLING*
*University of Minnesota*

Nature seems to have anticipated a pole when she designed a cedar tree. Her original specifications cannot well be improved on. They are so suitable and adaptable that, among high grade forest products, a cedar pole goes into service with a minimum amount of manufacture. A pole gives mechanically about the same kind of service in the line as it did in the tree, with its large end set in the ground and the small end supporting the load. While nature expects a tree to support its load under swaying stresses in all directions, in normal line service these stresses are largely limited to a direction at right angles to the pole line. In many respects a pole behaves as a tree, or a tree like a pole.

Physically the outstanding difference between a tree trunk and a pole is that the tree has always a high moisture content in its tissues, while a pole, at least above the ground line, has a comparatively low moisture content. This change in the amount of moisture present causes many of the troubles that a pole is heir to, such as shrinking, warping, checking, etc., due to the resulting internal stresses that are set up.

Stresses permeate the entire anatomy of a pole and can be released only by resupplying the lost water. Many of these stresses oppose each other so that their presence is not noticeable until one of them is released. This condition is not peculiar to a pole, but exists to some extent to all woods that are dry, regardless of their use. If wood is anywhere free from stresses it is in the living tree, but even here there is evidence that this stressed condition exists. While drying, or loss of water, is necessary to render wood suitable for use, it also protects wood from decay. If the sap wood of a pole at the ground line was as dry as that of the upper part of the same pole there would be need for butt treatment. It is worthy of note that in a living tree the heart wood usually is the first to decay, but when a tree is killed and converted into a pole the sap wood ordinarily decays first.

### Structure of Cedar Wood

The wood of cedar is simple and very uniform in its structure. Fundamentally it has structural features that are common to all woods and that cannot be changed by any process of treatment or manufacture without destroying the wood as such. Figure No. 1 shows a magnified view of the cross section of a portion of a pole showing its homogeniety, uniformity and average small amount of late wood is in the growth ring.

In order to understand how nature builds a cedar tree it is necessary to have a good idea as to where wood is formed as a tree grows. The only portion that is alive and that carries on the living and vital processes of growth is that part between the wood and bark called the cambium. Here all wood is formed, and not at the center of the tree commonly called the heart. It is well known how easily a tree may be killed by removing a strip of bark completely around the trunk. This severs the tree from its root system and death is the result. The vital heart may be said to be directly under and next to the bark.

As a cedar tree lives from year to year, it is active and growing during the summer period only and is dormant during the winter period. In early summer, growth is rapid and thin walled cells or fibers are formed, light in weight and light in color. After this rush period is over, it produces the same kind of cells, but with much thicker walls, forming wood that is darker in color and heavier than that formed in the first part of the growing season. By this process there is formed all over the tree, between the wood and bark, a layer of light colored wood known as "spring wood," followed by a layer of dark colored wood called "summer wood." These two layers taken together constitute the growth of the year called "growth ring" or "annual ring." Year after year as the tree grows it continues this process. Each new growth ring is placed on the outside of the one of the previous year and increases the diameter as well as the height of the tree. It is evident from this that the wood formed when the tree was young is in the center, while that formed when the tree is old is on the outside next to the bark. It follows then that the oldest wood of a pole is in the center while the youngest is on the outside, or in other words the sap wood is new wood while heart wood is old wood. These growth rings can readily be observed as alternate layers of light and dark colored wood on the cross or transverse surface, such as on either end of a pole, appearing as concentric rings.

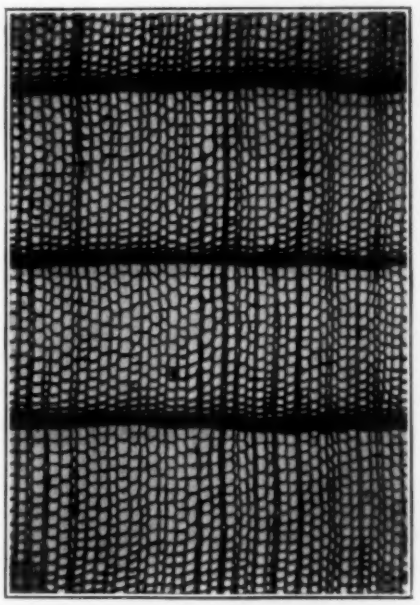


*Fig. 1. Cross or transverse section of cedar as the fibers appear magnified on the end of a pole. Note the homogeneous and uniform arrangement of the fibers and the small amount of "summer wood" in each growth ring. Microphoto by the writer.*

Furthermore these growth rings are constructed of wood elements or cells, of which there are but two kinds. One kind is spindle shaped, placed upright in the tree with the ends slightly overlapping. They are less than ¼ inch long, about 50 times as long as thick and comprise about 90 per cent of the volume of the tree or pole. The other kind of cell is very short, not over one thirty-second of an inch long and about four times as long as thick. They are joined end to end and form about 10 per cent of the volume of the tree or pole. All the cells, of both kinds, taken together are usually spoken of as "fibers" or wood fiber. All of the cells are hollow or have a cell cavity. In the heart wood the cells are empty and in the sap wood are more or less filled with starches and other substances, especialy near to the bark. No one knows how many cells in a pole. It is probable that there are more than one trillion in a single 30-foot pole.

A casual examination of the two ends of a pole will show that the number of growth rings is greater at the butt than at the top end. All of the rings at the top end also appear at the butt. The difference in number of the two ends, counting from the outside in toward the center, indicates the number of rings that came to a point within the pole and at the center. The difference in number also indicates the number of years required for the tree to grow to a height corresponding to the length of the pole. These rings may be narrow or wide. They may

*Abstract of an address made before the annual meeting of the Northern White Cedar Association, held at Minneapolis, Minn., January 31, 1928.

contain a large amount of late wood or a very small amount. They are also subject to other variations, some of which may affect the wood mechanically.

### Moisture in Cedar Wood

Ordinarily there is little use made of wood that is wet. Water is always present and it is impossible to remove all of

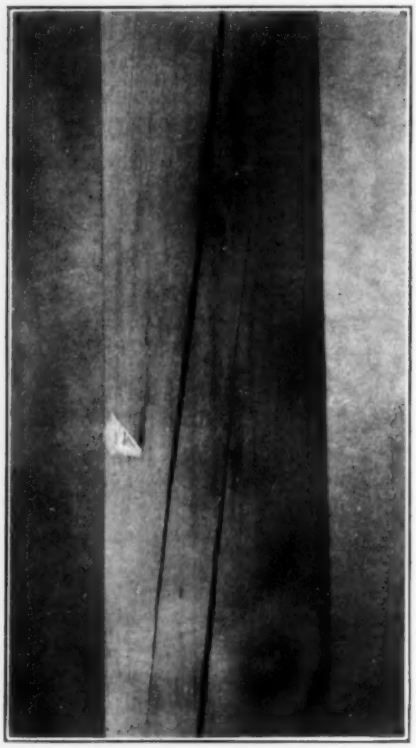


*Fig. 2. This shows a twisted or spiral grain with the side checks along the twist and not parallel with the side of the pole. The checks are parallel with the wood fibers. Photo by the writer.*

it without destroying the wood. The amount present varies with the degree of drying or seasoning. Wood substance has an affinity for water, so much so that the wood of a pole is never dry and its water content may vary with wide limits. Based on oven dry condition this amount may vary by several hundred per cent. A pole begins to lose water as soon as it is cut and unless submerged it will continue to do so until it comes to adjustment with the moisture conditions under which it is placed. In the open air it will come to atmospheric equilibrium and then fluctuate as the humidity varies.

A freshly cut pole has water in three forms, while a seasoned pole may have it in but two forms. There is:

First, *free water*. This is the water that can be observed in liquid form. If wood were readily compressible, it could be squeezed out as from a wet sponge. This is the water that fills all the fiber cavities and the spaces between them.

Second, *absorbed water*. This is the moisture that is actually absorbed by the cell walls or the wood substance. It corresponds to the water in a wet sponge when no more can be squeezed out. The wood is still wet but not visible water is present. It can be removed only by evaporation. It is this form of water that is directly responsible for shrinking, swelling, checking, warping and variation in hardness and strength. The removal of this water causes physical changes in the wood that widely affect its mechanical values.

Third, *chemically combined water*. When all the water is removed that can be accomplished by drying, there is still water present that is bound up chemically with the composition of the wood. It cannot be removed without destroying the wood. Water in this form is of no concern in the handling of wood.

A green pole has water in all three forms, while a thoroughly seasoned one has it only in the second and third form.

Nature maintains a high moisture content in a living tree. This is necessary in order that it may carry on the life functions. The highest percentage is in the region of new growth, or in the sap wood. Heart wood usually has less. As soon as a tree is cut and converted into a pole, the water which it contains begins to move outward and to evaporate from the surface. The free water mentioned above is the first to go and continues until all the water has gone from the cell cavities and from the spaces between the cells. This produces no change in the wood except loss of weight. The second form or absorbed water is next to go. Its removal causes all the troubles and difficulties incident to the drying of wood. The amount of this water present at any

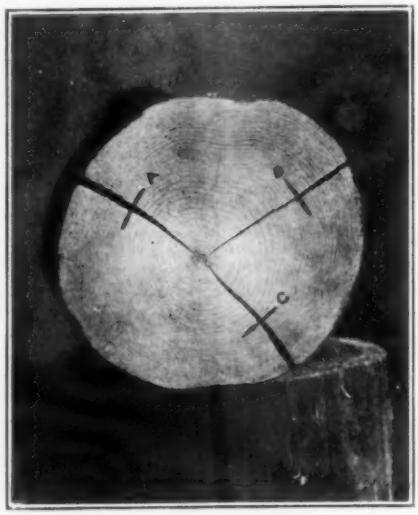



*Fig. 3. This shows the top end of a pole that had three small checks extending from the outside in only to the marks A, B, C. The top was cut off to supply a shorter length pole. The stresses caused by shrinking were released and the original three checks extended in to and joined at the center resulting in a split top. Photo by the writer.*

time is governed entirely by the relative humidity of the air to which the wood is exposed. The dividing line between free and absorbed water is known as the fiber saturation point, and corresponds to approximately 30 per cent moisture. If free water is again supplied the wood will take on as much or more than it originally had and will again give it up under drier conditions. When a pole has given

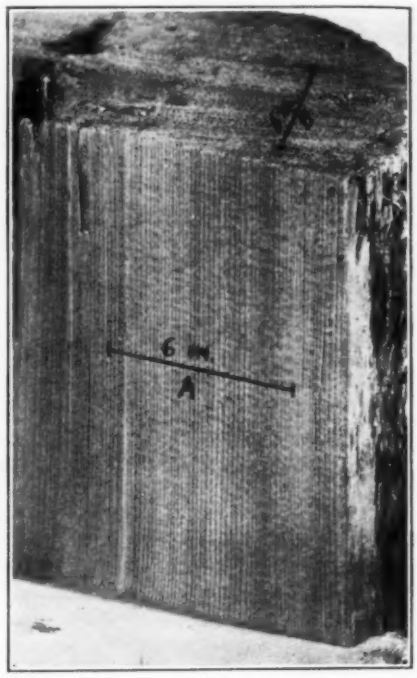



*Fig. 4. The wood along the 6-inch line A will shrink half as much as the wood along the 6-inch line B. A is along the diameter and B is along the circumference. Photo by the writer.*

off all the water possible under the existing atmospheric conditions it is said to be air seasoned or air dry. It still may have a moisture content from 12 per cent to 20 per cent. A pole in service has much free water from the ground line down, but from this point upward the moisture content may be far below the fiber saturation point.

Seasoning of wood means drying and the changes in the wood incident thereto. Nature has no seasoning problems. The necessarily high moisture content is lost only on the death of the tree. A dead tree will season on the stump and become air dry just as a pole will. Dry wood is rarely at rest. It takes on, or gives off, moisture with every change in humidity. This "working" continues indefinitely and ceases only under constant humid conditions.

### Shrinking and Checking

Shrinking occurs only after drying falls below the fiber saturation point. Checking occurs only after shrinking has begun. With few exceptions we use wood in an unnatural condition, since in its natural condition it has a high moisture con-

tent. Drying, shrinking and checking all go together. In the open air wood dries unevenly. It dries faster on the outside than it does on the inside of the wood. In a pole the outside portion may have a moisture content below the fiber saturation point with the inevitable shrinking taking place, while the inside has a moisture content above this point in which shrinking has not yet begun. This means that the more or less dry layer of wood on the outside of the pole has shrunken to the point where it is too small to cover the inside or unshrunken part. Stresses are set up that may eventually overcome the resisting strength of the wood and the fibers break along their length. In this ruptured or cracked condition wood is said to be checked. These checks do not extend across the fibers but along their length. If a pole is twisted the checks on the sides will follow this twist because the fibers are equally inclined. See Fig. 2.

Two types of checks are recognized, end checks and side checks. End checks usually radiate from the center or pith and are V shaped with the point at the center and the open part at the surface.

Not all end checks reach the center, but they are in line with this point and may extend in only a short distance from the outer surface. Side checks always extend vertically as the pole stands upright.

Checks may be very numerous, comparatively small and evenly distributed over the entire surface of the pole, or may be combined and concentrated in one large or several medium-sized checks. The larger the check the more serious it is. Large checks from opposite sides of a pole may meet in the middle and literally form a split in the pole. Fig. 3. This same amount of adjustment may be distributed in many small and shallow checks without very seriously damaging a pole. In either case, the same amount of shrinkage adjustment must be provided for, either in actual separation of the fibers, or checks, or in internal stresses that will form checks when released, as when the end of a seasoned pole is cut off. Fig. 3.

Checking is one of the conditions incident to the drying of a pole that cannot be avoided. A pole, like a log, is an entire section of a tree and the two check and shrink in the same way. A dead tree standing in its original position will check just the same as a pole or log will. Checks can readily be closed by soaking the pole in water and again swelling the wood, but they will reopen again on drying. Checking in a board must not be confused with checking in a pole. The board checks for the same reasons, but the factors governing the two have a very different application. A pole may be sawn into boards and the boards may be dried without any checking due to the equalization of the stresses and the simplicity of the grain.

A shrinkage differential is the basic reason for checking. A unit of length,

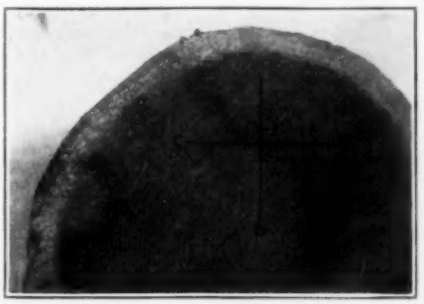


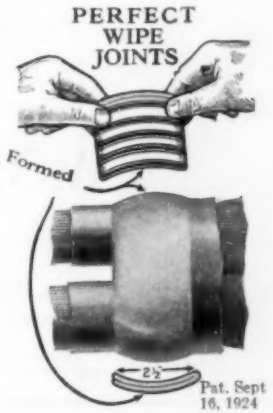
*Fig. 5. The two lines AB and CD are drawn on the end of a cedar pole. The line along the diameter AB will shorten, from green to dry condition, about 2½ per cent. The wood along the line CD, in the direction of the circumference, will shrink at the same time about 5 per cent. Photo by the writer.*

say, 6 inches, on the circumference of a pole will shrink about twice as much as the same unit of length—6 inches—along the diameter. See Fig. 4 and Fig. 5. Since the circumference is about three times as long as the diameter it is obvious what the shrinking and checking difference will be.

Wood cells or fibers shrink in cross section but practically not at all in length. Since over 90 per cent of the fibers are upright in the pole, it follows that a pole shrinks very little in length but very appreciably in circumference and diameter. Generally speaking, the shrinkage along the diameter is half as much as along the circumference. In cedar these values are about 2½ per cent for diameter and 5 per cent for circumference. Lengthwise shrinkage is about one-tenth of one per cent.

## WILLIAMS' WIPING CLOTH

Herewith we illustrate and describe a patent wiping cloth used for wiping solder joints on lead covered cable sleeves, in what is known to the industry as cable splicing. This improved pattern of wiping cloth, the advertisement of which appears elsewhere in this issue, is known as the formed-flexible-finished wiping cloth. It is the only mechanically-made wiping cloth ever produced, in as much as the permanent, true curvature of the flexible, pliable cloth is bound to mould the soft solder into a uniform body around the joint, thereby producing a uniform joint. The smooth, slick finish of the cloth which requires absolutely no breaking-in is obtained by forcing a specially prepared dressing into the grain of the cloth by two operations on a rotary polisher. The cloths are subjected to no wear by breaking-in, and will therefore give much more actual service than the old style shapeless, un-finished cloth. This improved pattern of cloth is fast being adopted by the telephone companies, telegraph companies and utilities, and wherever it is tried it is readily recognized by cable splicers as the only practical wiping cloth in existence. The cloths are reasonably priced and are much cheaper in the long run than the shapeless, un-finished cloth. Illustrative and descriptive literature with prices will gladly be furnished by the manufacturer, Geo. E. Williams, 3 East 26th St., Minneapolis, Minn.




## Sweden Now Linked with America

Telephone communication between all parts of the United States and the city of Stockholm, Sweden, was inaugurated Monday, February 20. The hours of operation will be from 6:30 a. m. to 5 p. m., the same as for British, Belgian, Dutch and German points.

The rate between Chicago and Stockholm will be $84.75 for the first three minutes and $28.25 for each minute thereafter.

The route traveled by an American-Swedish call is of unusual interest because of the number of stations through which it passes. Jumping the Atlantic to Great Britain by means of the radio telephone link, the call passes by submarine cable under the North Sea to Holland, thence across Germany via Hamburg to Rostock, where it again dives under water across the Baltic Sea to Malmo, Sweden. From Malmo the course is northeasterly by land cable to Stockholm, completing a total wire distance from London of approximately 1,000 miles. The total distance from Chicago to Stockholm by telephone is 5,582 miles.

Stockholm has about 116,000 telephones. With the extension of the service to Sweden, the total of European telephones available to the American caller will be more than two and one-half million.

Along the route between New York and Tampa, repeaters have been installed at Washington, D. C., Richmond, Va., Selma, N. C., Denmark, S. C., Jacksonville and Denellon, Fla., with terminal repeaters at New York and Tampa.

# *Southwestern Bell Ordered to Restore Service in Poteau*

The squabble down at Poteau, Okla., between the Southwestern Bell Telephone Company and the Oklahoma-Arkansas Telephone Company has finally been disposed of by the Oklahoma Corporation Commission, and the Southwestern ordered to accept and route messages over Independent lines as was the custom prior to the establishment of a switchboard at Poteau by the latter company for long distance service. The matter has been in litigation for more than a year, and was brought about through the Oklahoma-Arkansas company demanding a higher toll connection charge than the Southwestern was willing to pay.

The Independent concern finally "took the bull by the horns" and held out part of the collections for long distance service, and in turn the Southwestern installed a switchboard at Poteau and refused to route long distance calls over Independent lines, but on the other hand forced the Independent company to make physical connection with its board and proceeded to annex all the long distance business in that section.

The following press dispatch carries the final chapter in the matter:

Oklahoma City, March—The Southwestern Bell Telephone Company, which recently installed a long distance toll exchange at Poteau, where the Oklahoma-Arkansas Telephone Company was operating, Tuesday was ordered by the corporation commission to send its messages from Poteau, Wister, Heavener and Howe over the Oklahoma-Arkansas lines with its old exchange at Fort Smith.

The Oklahoma-Arkansas company recently came before the commission, alleging that it had been operating in the four towns with exchanges between them and a toll line running from Poteau to the Southwestern Bell exchange at Fort Smith.

On January 30, the company said, the Bell company refused to take further messages over its exchange but instead installed a long distance board in Poteau sending and receiving long distance messages and refusing to transport them from Poteau to Fort Smith on the Oklahoma-Arkansas line.

The complaining company also charged that the Southwestern Bell company refused to allow it to share in the long distance toll charges.

After the hearings, the commission finally ordered that service be resumed as it existed before the Southwestern Bell company established its Poteau office.

An agreement also was made as to payment of certain debts of the Oklahoma-Arkansas company to the Southwestern Bell company. The latter will be allowed to retain all toll charges it collected from its board from the time of installation until the commission's order became effective.

## Automatic Electric, Inc., Opens New Offices at Dallas and Seattle

Announcement has been made by Automatic Electric, Inc., of the opening of new sales and service offices at Dallas, Texas, and Seattle, Washington, to help maintain closer contact with the company's growing list of customers in both the extreme Southwest and the extreme Northwest parts of the country.

Mr. Charles G. Wilson will be in charge of the Dallas office, the address of which is 807 Marvin Bldg. Mr. Wilson has been a member of the sales department of the company for several years, traveling out of Chicago, largely among the telephone companies of the Southwest, and is well qualified for his new duties. The Seattle office will be in charge of Mr. A. F. Combs, who was for many years sales engineer in the Chicago territory and more recently has been associated with the company's Los Angeles office in a similar capacity. The address of the Seattle office is 933 Henry Bldg., Seattle, Washington.

*Charles G. Wilson, who is in charge of the new Dallas office recently opened by Automatic Electric, Inc.*

Goldston, N. C.—Central Carolina Telo. Co. has bought Bonlee Telo. Co. and Snow Camp Telo. Co.

Martinsville, Ind.—Martinsville Telo. Co. has cut over service to its new exchange at 39 East Jackson street.

Rochester, Ind.—Talma Telo. Co. has been bought by local company.

LaFollette, Tenn.—Southern Bell T. & T. Co. has bought Peoples Telephone Co.

## CONVENTION CALENDAR

**IOWA INDEPENDENT TELEPHONE ASSOCIATION**
Des Moines, Fort Des Moines Hotel
April 17, 18 and 19.

**INDIANA TELEPHONE ASSOCIATION**
Indianapolis, Claypool Hotel
May 9, 10 and 11.

**PENNSYLVANIA STATE TELEPHONE AND TRAFFIC ASSOCIATION**
Harrisburg, Penn-Harris Hotel
May 15, 16 and 17.

**UP-STATE TELEPHONE ASSN. OF NEW YORK**
Rochester, Powers Hotel
May 23, 24 and 25.

Public Utility Financing

P. W. CHAPMAN & CO., INC

170 W. Monroe St. Chicago — 42 Cedar Street New York

Boston Albany St. Louis Milwaukee Grand Rapids
New Orleans Seattle Portland San Francisco

# *Merger of International Tel. & Tel. Co. and Commercial Cable-Postal System Is Announced—$225,000,000 Capital Stock*

New York, March 20—Formal announcement was made here today of the merging of the International Telephone and Telegraph Company and the Commercial Cable-Postal Telegraph System into a world wide radio and telegraph network with combined assets aggregating $225,000,000 and combined capital totaling about $217,000,000. The merger of these two far-flung interests is the largest of its kind on record. The announcement was made by Clarence H. Mackay, president of the Mackay Company, and Sosthenes Behn, president of the I. T. and T.

The merger plans call for the formation of a new Commercial Postal Company under the chairmanship of Mr. Mackay. This company will acquire the outstanding shares of the Mackay Company, which controls the submarine cables and the land lines comprising the Mackay systems. These lines extend from Europe through the United States and across the Pacific to the Orient.

International Telephone and Telegraph Company is the operator of twenty-nine subsidiary foreign communication systems and All American Cables, Inc.

The official announcement says:

"The plan contemplates the formation of a new Commercial Postal Company under the chairmanship of Clarence H. Mackay which will acquire the outstanding shares of the Mackay Companies which control the submarine cables and land lines comprising the Commercial Cables and Postal Telegraph systems extending from Europe on the one hand through the United States to the coast of Asia on the other.

Eventually the organization of a new International Cables Company (Mackay System) is contemplated, also under the chairmanship of Mr. Mackay to take charge of the operations of the Commercial Cables.

**Exchange Stocks and Bonds**

"The plans for exchange of the existing preferred and common shares of the Mackay Company and the 4 per cent 500 year first mortgage bonds and debenture stock of the commercial cable company on the following basis:

$18,000,000 of the 25-year collateral trust 5 per cent bonds of the new company are to be issuable in exchange for the $20,000,000 first mortgage 4 per cent bonds and debentures stock of the Commercial Cables on the basis of $900 face amount of new bonds in exchange for each $1,000 (£206) face amount of 4 per cent first mortgage bonds and debenture stock.

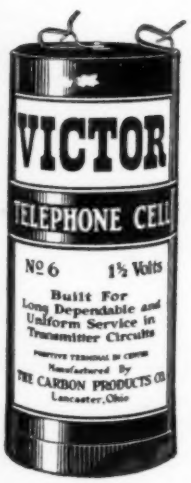
"Mr. Clarence H. Mackay will become a member of the board of directors and of the board of directors and of the executive committee of the International Telephone and Telegraph Corporation, and will assume an executive part in the direction of that company. In addition he will be the chairman of the companies which will operate the Commercial Cable-Postal Telegraph Companies."

---

### Court Awards Judgment of $30,000 at Lake Andes

Lake Andes, S. D.—An interesting legal case of long standing was decided when Judge A. B. Beck, rendering a judgment of $30,000 and interest, since 1914, in favor of E. C. Ward and other owners of the Missouri Telephone company of Gedes, against the Dakota Central Telephone company. The case alleged fraudulent conversion of the Missouri Telephone company property.


VICTOR TELEPHONE CELLS




Uniform quality assures to you a lower average in replacement cost.

The Carbon Products Co.
LANCASTER, OHIO
11 South La Salle Street, Chicago

HOTEL FORT SHELBY
LAFAYETTE AND FIRST DETROIT

WHETHER your choice be one of the many very comfortable rooms at $2.50, $3 or $4, or one of the richly furnished suites in the 22-story recent addition, whose sunny bay windows give an entrancing view of city, river and Canadian shore, you will enjoy a special sense of value in Hotel Fort Shelby.

All rooms have Servidors. Convenient to all downtown; principal shops almost at the door. Garage in connection; cars delivered without service charge. Excellent facilities for conventions.

*Brochure on Request*

# *Sound Telephone Accounting Is Stressed at Oklahoma Convention*

R. J. Benzel*

Sound telephone accounting is not only desirable but has become a necessity if those who manage telephone properties are to become successful. Uusually the telephone property in any town ranks either first or near the top in the amount of invested capital, the amount of payroll, the number of employes, and importance in the business and social life of the community. Truly the telephone company is the ever-watchful sentinel in the community, safeguarding at all hours of the day, three hundred sixty-five days of the year, life and property. In small towns usually the telephone office is the only office open all night. It is through the telephone service that police, fire and storm protection, and emergency calls for first aid to doctors and others are given. Every day some outstanding unusual service is rendered by some telephone employe, saving life and property.

In practically all of the states the telephone companies are regulated by State Commissions. Many of those companies also are regulated, in so far as their accounting is concerned, by the Interstate Commerce Commission. The Interstate Commerce Commission in 1910, set out to promulgate such an accounting system, and in November, 1911, sent out a tentative system to the various companies, asking for comments and suggestions. Effective January 1, 1913, that Commission classified, according to volume of business done, the telephone companies of the country into four classes, known as A, B, C, and D, and prescribed a uniform accounting system for A and B companies. On January 1, 1915, it prescribed a uniform system for Class C telephone companies. An accounting system for the D, or smaller, companies has not as yet been prescribed. In other words, companies whose gross annual revenue is $50,000.00 or less do not as yet have an accounting system prescribed by the Interstate Commerce Commission. However, Class D companies are required to file with the Interstate Commerce Commission copies of annual reports filed by them pursuant to orders of State Commissions under which they operate. Many of the State Commissions have prescribed accounting systems for the smaller or Class D companies.

At first many telephone managers hesitated to adopt the new and somewhat more elaborate accounting system, thinking that considerable expense would be added if such a system were adopted, and did not desire to change as they thought they were doing well enough under their own system. I think time has changed this, and practically every one I believe now feels that the most important thing in the management of their business is a system of accounts that will reflect at all times the results of the operation of their business. Without a good system of accounts it is impossible for anyone to determine just what they have actually invested in the property, or what it is costing them to operate after it has been constructed.

By proper use of an accounting system one is able to determine the cost of doing business, and apply corrective measures where and when such are necessary. It also permits of planning additions or replacements to property to extend or improve the service, and, last but not least, it shows to the manager whether or not he is obtaining sufficient revenue to defray his expense of maintenance, operation, taxes, and pay a fair return.

To those of you who have not as yet adopted a uniform system of accounting, I believe it is well worth giving it consideration and trial, and, merely as suggestion, I offer the following as a simple accounting system that can be applied without much time or expense:

Any accounting rules or practices should, of course, be made to embrace the average conditions in general for any particular class of telephone companies. The small companies must be able to comply with the instructions without too much expense. The large companies in complying should obtain sufficient data and reports to reflect the true operations and condition of their business. Such a record should naturally be concise, yet as complete as possible, and usually divides the accounts into two classes: (a) Balance sheet accounts, or assets and liabilities, including any surplus or deficit for a given time; and (b) Income accounts, including revenues, expenses and income deductions.

In order that the necessary accounts be kept and proper reports rendered, only a few records are necessary.

The general ledger for balance sheet accounts should be kept, showing for each account the debits and credits, with the resulting monthly or other periodic balance, according to the requirements of the reporting. Entries to the general ledger should be posted from a record or summary usually termed a cash journal.

The cash journal should include all entries, debits and credits, that will ultimately be entered in the general ledger, and the total debits on the cash journal should equal the total credits. In fact, the total debits and credits on each journal or cash entry should be in agreement. Each entry should recite and describe its nature and source. In posting cash collections, on the debit side, cash should be charged for each item and accounts receivable and the individual credited. In the journal entry the various accounts should be charged and credited, and the proper explanation of the entry made. For example, summary of material used would show the proper plant or repair accounts charged and material and supplies credited.

There should be a subscribers' ledger showing the telephone or account number, name of subscriber, rate, date of installation or disconnection, etc. Various columns for the monthly charges for exchange and toll service should be provided, as well as for credits and allowances, and the amounts should be posted to the individual accounts. These cash items should be recorded, of course, in the cash journal, so that the proper journal entry may be made at the end of the month or other period. At the close of the month the subscribers' ledger should be totaled as to the various columns, and the total debits should equal the total credits, including the balance due. Then the journal entry should be prepared from these amounts, crediting exchange revenue, toll revenue, and miscellaneous revenue, and charging accounts receivable from subscribers with the total of these three items after any allowances have been deducted. Amount of the allowances, if charged against revenue, should be deducted and the net amount credited to revenue, or, if the allowances are chargeable to deductions, the net amount should be charged to accounts receivable from subscribers, making the proper charge therefor to deductions.

There should be a subscriber's bill or statement for exchange service, and another one for toll service. Any miscellaneous charges can usually be entered on the exchange service statement.

The exchange statement should include the monthly, quarterly or other periodic charge for exchange service.

The toll statement should detail the various toll messages by date, item and amount.

In paying sundry disbursements or wages a voucher check should be used. On the stub of such check should be the classification or the account to which the item should be charged. For example, salary checks should be charged to operating salaries and wages, unless same are for construction, repairs, or depreciation.

There should be a daily work report for the construction or maintenance employes, showing time devoted to each class of work, the materials used, expenses incurred, material recovered, with a descip-

*Abstract of a Paper Read at the Tenth Annual Convention of the Oklahoma Utilities Assn., Tulsa, Oklahoma, March 14, 1928.

COVERED BY SEVERAL PATENTS
No. 83 QT.
No. 84 PT.
For gasoline.

## Consider Quality First

A **poorly constructed tool** of any kind is expensive even at a very low price.

When again ordering torches and furnaces, consider carefully the quality and merits of the "ALWAYS RELIABLE" line. The leading make on the market today. FULLY GUARANTEED.

Order through your regular distributor, or mail your order to us with the name of your regular distributor.

**OTTO BERNZ CO. INC., NEWARK, N.J.**

Established 1876

# Exide

## BATTERIES

With an Exide battery on the job, a long life of dependable, trouble-free service is assured. That is why Exides are so generally used by the telephone systems throughout the country.

**THE ELECTRIC STORAGE BATTERY CO.**
**PHILADELPHIA**

Exide Batteries of Canada Ltd., Toronto

## STANDARD Copper Clad Steel Wire

TRADE C.C.C. MARK

Combines the strength of steel with the conductivity and rust-resistance of copper. Bulletin 202 explains how you can save money by using No. 17 Copper Clad instead of No. 14 copper.

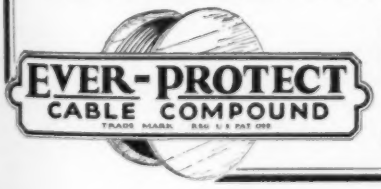
**Standard Underground Cable Co.**
*Division of General Cable Corp.*
General Offices: Pittsburgh, Pa.
Branches in principal cities.

## Get EVER-PROTECT aid in your construction.

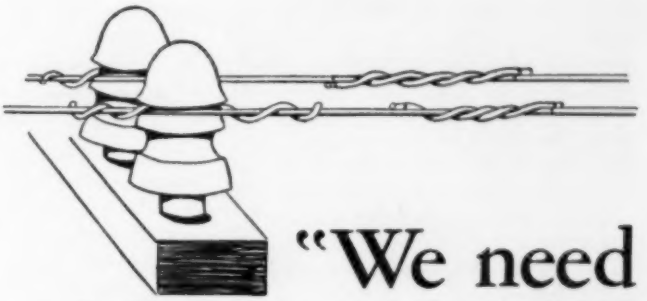
EVER-PROTECT has proved practical and profitable in making many hundreds of cable installations underground without a conduit. It protects cable against storm damage, corrosion, chemical action, electrolysis and abrasion.

In liquid form EVER-PROTECT is great for overhead work, protecting your cable and messengers against chemical action and other destructive influences.

Ask your nearest jobber for complete details.




**National Cable Compound Co.**
Incorporated
MITCHELL - - IND.



# "We need *solder protection*"

—said the first splice to its mate. "Certainly the plant manager expects too much from us—we're exposed to all the elements and have little or no protection. But he protects our sheltered terminal mates at the switchboard."

"Yes, I know," responded the second splice, "when I was put together my copper sleeve made a very poor fit. The lineman paid no attention—just twisted me up. When it is damp or raining I fill with water. Last winter I froze a dozen times. My copper body is so stretched, I am getting weaker and weaker."

"Too bad," remarked the first splice. "But I'm in a worse physical state—when I was formed the lineman "burned" one of the wires inside my sleeve. Being inside, he, of course, couldn't see it. The strain was terrible under the loads of ice last winter. Now, when the wind sways the line, the current can't flow through me continuously—my customer continually complains. The lineman who was hunting the trouble looked me over just as the wind swayed me into contact. I couldn't make him understand what was wrong. It may be months before they find the trouble."

"I'm sorry," rejoined the second splice, "the smoke from that house is playing havoc with me—it eats into me like cancer. The penetrating air makes it oxidize, and when the current finally fights through it's so weak, I feel guilty. Some day I hope they'll come to our rescue with Kester Acid Core Solder. Then we can serve equally as well as our terminal mates that are protected with Kester Rosin Core Solder."

"It costs so little and means so much," concluded the first splice, "and it *will protect us* from these destructive agents. Then we'll give *service*—not trouble."

Try a few of your worst lines and convince yourself. Order a five pound spool for a starter from any telephone supply house.

### KESTER *Acid Core* SOLDER

For all iron lines use Kester Acid Core Solder. The scientific flux in Kester is less corrosive than the alleged non-corrosive pastes now on the market. It is much cleaner and far more active. Packed on 1, 5, 10, and 20 lb. spools, and 1 lb. coils in cartons. Standard gauge No. 3 about 1-8 inch in diameter. (Can be furnished in several alloys and many gauges.)

### KESTER *Rosin Core* SOLDER

For all switchboard and inside work use Kester Rosin Core Solder. Absolutely non-corrosive, pure rosin flux inside this genuine solder makes it safe, simple and sure on any delicate job. Packed on 1, 5, 10, and 20 lb. spools, and 18 in. lengths in 5 lb. boxes. Standard gauge No. 5 about 3-32 inch in diameter. (Can be furnished in several alloys and many gauges.)

*Samples upon request*

# KESTER SOLDER

*Self-Fluxing*

Manufactured by

**CHICAGO SOLDER COMPANY**
4218 Wrightwood Avenue, Chicago, U.S.A.

Originators and World's Largest Manufacturers of Self-Fluxing Solder

tion of the location and elements of plant constructed, removed or abandoned. It is not presumed that the employe actually performing the work in all cases will be familiar with the cost of the plant retired, but his description of such work and plant should identify that portion so that the bookkeeper can determine the estimated cost and make proper entries. There should be a summary of these daily work reports each month, summarizing to the various accounts, such as plant and equipment, repairs, or depreciation, the charges for labor and other expenses, also charges for material used and credits for material removed and recovered. This summary then should form the basis of a journal entry, being sure that the total debits of the entry equal the total credits.

Where such reports are kept it might be more convenient to make the distribution of the time of employes engaged in this class of work from these reports once a month, rather than attempt to place it on the voucher check.

The cash journal should contain columns headed with the most commonly used items, for charges and credits, and another miscellaneous or sundry column for such postings as are less frequent. At the close of the month, after the total debits and credits of the cash journal are found to agree, the totals of each column, except the sundry, may be posted directly to the general ledger, to the respective accounts, but it will be necessary to post individual items appearing in the sundry column.

After all entries are posted to the general ledger, the debits and credits should be separately totaled (preferably in pencil), and the difference or net balance for each account set out on the debit or credit side of the ledger, as the case may be. After all such accounts in the ledger have been so treated, the net balances should be transferred to a trial balance sheet or book (such books can be purchased in most book or drug stores) opposite the name of the particular account, being careful to put the debits in the debit column, and the credits in the credit column. If all entries have been properly posted to the ledger, and the figures properly totaled and carried to the trial balance book, then the debits and credits will agree in total, if properly added.

Then statements of assets and liabilities, revenue and expense, commonly called income statements, can be easily prepared, which will show the financial condition of the company.

In closing, I believe that those companies who have kept systematic records appreciate the full value not only in knowing just how the business is being conducted, but in being able to make promptly, any special reports required by regulatory bodies, and in the preparation of information for rate revisions, or for answering any subscribers as to just what the company is doing from time to time.

## International Has Big Gain in 1927

The International Telephone and Telegraph Corporation announced that the consolidated income of that Corporation and its Associated Companies for the year 1927, was $14,413,495.28, as compared with $7,105,206.44, for the year 1926. The earnings for 1927, reflect the acquisition by the Corporation of the greater part of the capital stock of All America Cables, Incorporated, Montevideo Telephone Company, Ltd. The Chile Telephone Company, Ltd., and Companhia Telephonica Rio Grandense, control of which was acquired since January 1, 1927.

The earnings for the year 1927, are equivalent to $11.07 per share on the 1,301,994 shares of stock outstanding at December 31, 1927. The number of shares of stock outstanding was increased during the year from 585,983 shares outstanding at December 31, 1926, to 1,301,994 shares outstanding at December 31, 1927, an increase of 716,011 shares.

## Kellogg Publishes a New Repeating and Drainage Coil Bulletin

Operating telephone companies will be interested in the new bulletin, "Repeating and Drainage Coils," now being distributed by the Kellogg Company.

This bulletin contains complete information on repeating coil characteristics and shows how phantom circuits can be built and properly protected. The important subject of transpositions is thoroughly explained and illustrated. Circuits showing how the ever increasing problem of inductive interference from high tension power lines can be reduced are included. A brief résumé is also included on the uses of repeating coils in switchboard cord, line and trunk circuits.

Those desiring can secure a copy from Kellogg Switchboard & Supply Company, Chicago, Illinois, by asking for Bulletin No. 201 Repeating and Drainage Coils.

## New Book on Operating Practices for Smaller Offices

The United States Independent Telephone Association announces a new book, "Local Operating Practice for Small and Medium Sized Offices." The book is written by Miss Anne Barnes and sells for 25 cents. She is also the author of "Correspondence Course in Local Operating."

There is a charge of $1.00 for the correspondence course for enrollment per person enrolled. Enrollments are limited to operators of member companies of the association. Further information may be obtained by writing Chas. C. Deering, chairman of traffic division, United States Independent Telephone Association, 409 Royal Union Life building, Des Moines, Iowa.

## Paris Now Has Transatlantic Phone Service

Transatlantic telephone service from all parts of the United States was extended to Paris, France, at 9 a. m., Chicago, time, Wednesday, March 28, it was announced by the Illinois Bell Telephone Company. France makes the fifth continental European nation to be added to the transatlantic circuit. The rate from Chicago to the French capital will be $51.75 for three minutes and $17.25 for each additional minute.

Special interest attaches to the opening of service to Paris as the first words spoken by the human voice to be heard across the Atlantic were received at the Eiffel Tower in Paris, in 1915, by Bell System engineers, who were stationed there to listen to signals sent by other telephone engineers who were conducting experiments at the United States Naval radio station at Arlington, Va.

## New Switchboard Installed

A new switchboard has been installed at the Burnside exchange of the Mississippi Valley Telephone Company, and other improvements will be made soon, according to a report made to the Carthage, Ill., Journal.

## Comprehensive Catalog Issued by the Kellogg Company

The Kellogg Company is distributing a very attractive and interesting bulletin treating on the requirements of magneto exchanges. Telephone managers and others interested in furnishing this class of service will find this booklet full of valuable information.

Various problems arising from different conditions have been analyzed and the correct solution offered. A complete list of circuit prints with the application of each circuit is one of the features. The correct method of installing a magneto switchboard is included.

Several pages have been devoted to ringing equipment, storage batteries and protective apparatus, with recommendations for each particular case. Cuts and prints show the correct method of setting up or installing this apparatus.

The complete manner in which the Kellogg Company's line of magneto switchboards is described makes this section especially interesting and instructive.

If you haven't received a copy or you want additional copies, you are invited to write the Kellogg Switchboard & Supply Company at 1020-1070 West Adams Street, Chicago, Illinois, for their bulletin No. 121.

# In the Day's Work

*An Advertisement of the*
*American Telephone and Telegraph Company*

THE Mississippi was rising sullenly—ripping jagged crevasses in even the most stoutly built levees, inundating wide areas of farm lands, making thousands homeless.

At one of the many towns facing the crisis, a break came spreading ruin through the streets. A government steamer rescued 900 refugees, but the four telephone operators refused to forsake their posts. The telephone company notified the operators that they were not expected to stay. Friends warned them to leave at once. They decided to remain on duty, and the exchange was the only thing in town that continued to carry on.

The world hears little of "the spirit of service" until times of emergency and disaster . . . when a flood on the Mississippi or in New England, a storm in Florida or St. Louis commands the attention of the whole nation. But behind the scenes this spirit is always present. Each hour of every day, telephone calls of life or death importance speed over the wires of the nation-wide system, and telephone users confidently rely upon the loyalty and devotion to duty of the men and women who make this service possible.

"Get the message through." That is the daily work of the more than 310,000 Bell System employees.

## Cedar Pole Standards Are Being Constantly Improved

A new folder has just been issued by MacGillis & Gibbs Company, Milwaukee, Wis. This folder has many illustrations of cedar poles, both in use and in the yards; some of the poles have been in use for ten years.

*MacGillis Class B40' White Cedar in Line of Wisconsin Valley Electric Company, Wausau, Installed* 1925

The folder does not give data on the soundness of cedar poles, nor the life of cedar as used in the telephone industry, but it does show the grading of poles has been improved during the past few years. The illustrations show the difference in grading under the specifications prior to 1925 and the grading under the MacGillis standard of 1927. Under the new standard a much neater and straighter pole is shown. Any length and size pole can be secured from this firm.

"Standard practice requires butt treatment on all cedar poles used for permanent construction. The value and economy of this slight added investment have been thoroughly proven. Our facilities are modern in every respect and are ample to permit the prompt loading of every pole," states this concern in an advisory way. For one of these folders write the MacGillis & Gibbs Co., Milwaukee, Wis.

## Earl L. Carter Enters Engineering Field

Earl L. Carter, for the past eleven years chief engineer of the Public Service Commission of Indiana, resigned his position of April 1 and has entered into a general public utility consulting practice with offices at 613 Merchants Bank building, Indianapolis, Ind.

Mr. Carter has had considerable dealings with the telephone fraternity in Indiana and other states and his ability and wide acquaintance should establish him at once in a nice business.

## W. N. Matthews Corporation Opens New Offices at Philadelphia and Buffalo

A Philadelphia office of the W. N. Matthews Corporation has been opened up under the management of J. B. (Bake) Harris in the Real Estate Exchange building. With Mr. Harris are associated Messrs. C. H. Mueller, C. A. Batte, W. C. Grew and H. E. Dickinson. The Philadelphia office will be under the supervision of our New York district manager, L. M. Meckler, Jr. Their territory will be Pennsylvania east of Altoona, and the state of Delaware.

Effective April 1, 1928, the E. S. Stickle Company, 934 Union Trust building, Pittsburgh, Pa., will succeed M. P. McClure as the Matthews representative in the Pittsburgh territory. This territory covers Pennsylvania west of Altoona, the state of West Virginia and the following counties in Ohio: Mahoning, Columbiana, Carroll, Jefferson, Harrison, Belmont, Monroe and Washington. With Mr. Stickle are associated Messrs. H. V. Varney, A. H. Riehl, J. G. Mitchel and A. L. Link.

A. L. Link will open a Buffalo office for the W. N. Matthews Corporation at 40 West Seneca street, Buffalo, N. Y., and will be under the joint supervision of L. M. Meckler, Jr., New York district manager, and E. S. Stickle. Mr. Link's territory will be that part of New York state west of, but not including, Albany.

## District Conference

The April district conference of the Illinois Telephone Association will be held at Robinson, Ill., Wednesday, April 25. The host company is the Commercial Telephone Company. Frank Newman and his assistants are planning a very enjoyable and instructive meeting. The district meetings are a means of getting in touch with the latest and most effective methods in operating and management. They are planned to afford concrete help and workable plans for improving service.

*MacGillis Class A35' White Cedar in Line of Fort Dodge, Des Moines & Southern Railway, Installed* 1917

## The "STEWART" Direct Reading Test Cabinet

Measures shorts, crosses and ground direct in ohms. Resistance to trouble is read off the scale the same as volts off a voltmeter.

Any telephone man can install it and use it. Will save many times its cost in a year.

It costs more to do without the Test Cabinet than to buy one. Write for circular. Sent on trial.

**Also, Test Sets, Cable Testers and Detecto-Meters.**

**STEWART BROTHERS**
OTTAWA, ILLINOIS

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## Blake Insulated Staples

Unequalled for telephone and bell wiring. The fiber insulation prevents troublesome short circuits and grounds. 4 sizes. Pat. Nov., 1900. Write for samples.

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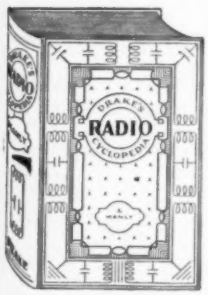


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**Prest-O-Lite equipment offers a wide variety of flames. From a wide brush flame for general soldering and heating to a small sharply defined flame for making delicate connections**

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**Ask the Prest-O-Lite distributor about this equipment or write us direct for complete information.**

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## Changes in Standard Underground Cable Co. Organization

Standard Underground Cable Company, Division of General Cable Corporation, has recently made the following changes in its general sales organization:

A. B. Saurman, formerly vice-president and general sales manager, has been made vice-president and consulting general sales manager and will continue his headquarters at the general offices in Pittsburgh upon his return from the south where he has been for some time on account of ill-health.

*Harold P. Childs, General Sales Manager, Standard Underground Cable Co.*

Harold P. Childs has been made general sales manager. Mr. Childs started with the Westinghouse Machine Company in 1903, going through the gas engine, steam engine, and steam turbine departments. He then became engaged in sales in the Pittsburgh office. Later he came to New York. He was made manager of the Westinghouse Machine Company in charge of Philadelphia and Baltimore offices. From there he went with the International Motor Company as manager of their Philadelphia, Baltimore and Washington offices. He returned to Westinghouse Machine Company in 1913 as special representative of the eastern district in charge of public utility work.

During the war he was abroad with the 23rd Engineers, A. E. F. Mr. Childs holds the rank of major, Engineers Reserve Corps.

Shortly following the war and from 1921 to 1925, Mr. Childs was with the General Electric Co. in the executive office under Mr. Anson Burchard, vice-chairman of the board, and Mr. Lovejoy, vice-president. In September, 1925, he joined the Servel Corp. as vice-president in charge of sales and advertising. Mr. Childs' connection with the Standard Underground Cable Company became effective March 15.

### WANTED TO BUY

Several sections of full feature common battery switchboard. Address S. H., care TELEPHONE ENGINEER.

POSITION WANTED—As lineman by experienced man. Prefer Illinois. Strictly reliable. Address Edgar T. Post, Owensville, Mo.

## New Telephone Line Links Mexico City and Puebla

Mexico City — Another long distance system of telephones has been opened in Mexico in connection with the projects to connect Mexico City with various outlying points in the republic. The new line runs between here and Puebla, capital of the state of Puebla.


**DEAN ELEC. CO. EQUIPMENT**

| | |
|---|---|
| Dean non-breakable desk sets, steel boxes, straight line ringers | $4.50 |
| Same with harmonic ringers | 5.00 |
| Dean steel bell boxes only, straight line | 2.50 |
| Same with harmonic ringers | 3.00 |
| Dean desk stands only | 2.50 |
| Dean steel hotel sets (induction coil type) | 4.50 |
| Dean self-contained ringers, 500 ohm | .50 |
| 1000 ohm | .75 |
| Dean brass cup slip type receivers with new shells and caps | .75 |
| Same as above with good used shells and caps | .50 |
| Dean compact magneto wall sets (enclosed binding posts) 3-bar 1000 ohm | 7.00 |
| 4-bar 1600 ohm | 7.50 |
| Same with exposed binding posts | $5.50 & $6.00 |

**BUCKEYE TELEPHONE and SUPPLY CO.**
Columbus, Ohio

**CHAPMAN LIGHTNING ARRESTERS**
MADE BY
MINNESOTA ELECTRIC CO.
MINNEAPOLIS, MINN.

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*CONSULTING ENGINEER*
613 Merchants Bank Bldg. Indianapolis, Ind
Special attention given to all matters pertaining to Valuations and Investigation of Public Utility Properties.
Formerly Chief Engineer, Public Service Commission of Indiana

**J. G. WRAY & CO.**
Telephone Engineers
Specialists in Appraisals, Rate Surveys Financial Investigations, Organization and Operation of Telephone Companies
J. G. Wray, Fellow A. I. E. E.
Cyrus G. Hill
Rm. 2130 Bankers Bldg., Chicago

**SCRAP PLATINUM**
Highest prices paid for discarded or obsolete telephone and switchboard apparatus; platinum contact relays, ring keys, etc. Have specialized in this field for many years.
CONTACT METALS CO.
2500 S. Wabash Ave., Chicago

**RECONSTRUCTED EQUIPMENT**

| | |
|---|---|
| Western Electric No. 2A, 3A or No. 25A Repeating coils, 2 coils mounted per strip @ | $ 4.50 |
| Western Elec. No. 22 3-bar Bdg. generators complete with mounting screws and crank @ | 1.40 |
| Kellogg No. 15 3-bar Bdg. Generators complete with mounting screws and crank @ | 1.75 |
| Stromberg-Carlson No. 992 type 3-bar 1000, 1600 or 2500 ohm Bdg. desk sets @ $9.50—4-bar $10.50—5-bar @ | 11.00 |
| Kellogg No. 2696 type 3-bar 1000, 1600 or 2500 ohm Bdg. compacts @ | 7.75 |
| Kellogg No. 2696 type 4-bar 1000, 1600 or 2500 ohm Bdg. compacts @ | 8.75 |
| Gray 3-slot pay stations, wall or desk type @ | 5.75 |
| Monarch Latest type Steel hotel sets with enclosed gongs, Straight line or Harmonic with 16, 33, 50 or 66 cycle ringers @ | 7.00 |
| Western Elec. No. 1317 3-bar 1000, 1600 or 2500 ohm Bdg. compacts @ | 8.25 |
| Leich Elec. Frequency converter, operates off 110-volt A. C. Light Ckt. and delivers 20 cycle, 90 to 100 volts ringing current, @ | 37.50 |
| Kellogg Local or Common battery transmitters complete with new mouthpieces and backs @ | 1.10 |
| Western Elec. No. 143 Receiver shells with caps, per lots of 100 | 35.00 |
| New Mouthpieces for any make Transmitters @ | .07 |

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Specialization on Public Utility Accounting Records and Audits enables us to best serve Telephone Companies.
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**Telephone Repair Work**
done at the old reliable
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14 Mills — Main Office—Chicago, Ill. — 36 Warehouses
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CROSSARMS — FIR — Creosoted — Yellow Pine
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If you are in a hurry your order can be loaded and on the way the same day we receive it.
Quality poles since 1882 assures you of guaranteed stock and satisfactory dealings. Let us quote you prices.
**Northern and Western Cedar**
**With or without butt treatment**
**NAUGLE POLE & TIE COMPANY**
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Branches: New York, Columbus, Kansas City, Spokane Vancouver, Boston Yards: *Minneapolis, *Pinconning Mich.; *Spokane, *Sand Point, Ida.; Vancouver, B. C. *Butt-treatment plants and Pentrex incising machines.

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**Bell Cedar Poles**
**Piling & Ties**
*Western Red - Northern White*
Creosote Butt Treating—Any Specification
Guaranteed N. E. L. A., W. R. C. A., N. W. C. A. Grades
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**Minnesota Transfer, Minn., Newport, Wash.**
Other Concentrating Yards at British Columbia Points
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Specify CHANCE ANCHORS Your Jobber Will Supply you
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**INSURE YOUR OVERHEAD LINES**
**BY SPECIFYING**
**NORTHERN or WESTERN**
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**MacGillis & Gibbs Co.**
**120 E. Wisconsin Avenue, Milwaukee, Wisconsin**

POLES TREATED WITH CARBOLINEUM (reg. U. S. Trademark 144048) ordered from Treating Plants are billed "Avenarius Carbolineum treated poles," this is your guarantee and protection against substitution. If you do your own treating, write for Folder 57 and prices on the genuine product used all over the world since 1876.
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**REPUBLIC POLES**
Northern and Western Cedar
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**REPUBLIC CEDAR CO., Marinette, Wisconsin**

## Matthews Woodpecker Telefault Will Not Wear Out

Recently a letter was received from an employe of the Bell Telephone Company, which gives some unusual information on the lasting qualities of the Matthews Woodpecker Telefault. From the description of this cable splicer, it seems

*Latest type Matthews Woodpecker Telefault*

that this Matthews machine just cannot be injured beyond repair. Listen to what he has to say:

"I am shipping to you today by express Matthews Woodpecker Telefault No. 3029. This machine has been out of service for about four years. I found it in a wareroom in Water Valley. The case was warped and split. The machine would not run. The whole thing was a ball of cobwebs and dust. Found two bad connections, cleaned it up and adjusted it, and located three cable faults in 45 minutes, that I had looked for every chance that I had had, for three months with a ——— test set that our company has been furnishing to us. The machine that I am sending to you is not just as it should be, because of the mistreatment that it has had before I got it. Will you please go over it and make the necessary repairs, and ship it to me express, and charges collect, at Charleston, in care of ———? I am a cable splicer in the ——— Division, doing cable maintenance work. I believe that this machine is all that I have heard the 'Old Timers' say it is. I consider myself lucky in finding it, for it will save me much hard work, and enable me to do a much better job in less time. Thanking you in advance for your prompt attention to the above."

This is the same Matthews Woodpecker Telefault that they are now selling. One of the reasons for its peculiar efficiency, is the fact that only one battery is required with it. It sends out a tapping tone on the wires in trouble, which sounds exactly like the tapping of a woodpecker on a pole. The fact that only one battery is used, keeps the voltage so low that it does not dry out the damp spots before the troubleman can reach them.

The patented exploring coil is two or three times as sensitive as any other exploring coil. Due to the use of a condenser in it, this makes it more sensitive, and in a measure acts as an amplifier for the tone put out on the line in trouble by one battery, which could not be heard by using an ordinary exploring coil. This has an added advantage of not "noising" up other working pairs, and thus causing complaints from other subscribers.

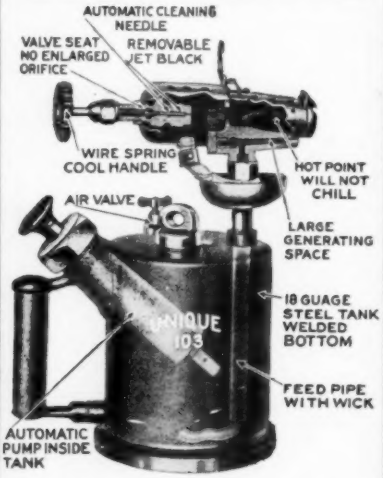
## Bell Telephone Pioneers to Meet in Boston November 2nd and 3rd

The seventh meeting of the general assembly and fifteenth meeting of the Telephone Pioneers of America will be held at Boston, Mass., on Friday and Saturday, November 2nd and 3rd, 1928, with headquarters at Hotel Statler.

An outline of the program for the General Assembly Meeting and the Annual Meeting of the Association, together with information in connection with Hotel and Railroad Rates, will be furnished as soon as convenient.


TRY A
TELEPHONE ENGINEER
WANT AD
RESULTS COUNT

UNIQUE
BLOW TORCH




It starts quickly, operates in any position, and produces a remarkable heat. It is a great worker in cold and windy weather.

The automatic orifice cleaner, one of the details shown in the illustration, is but one of a number of exclusive features that make the Unique your greatest value in blow torches.

Painstaking care by interested workmen, an actual "burning test" before shipping, is just another detail responsible for their uniformity and efficient burning qualities.

*Write for complete details*

**Unique Manufacturing Co.**
221 Whiting St. CHICAGO, ILL.

BRIDGING twisted pair to twisted pair, a practical application of the Kearney Solderless Service Connector.

FOR Telephone Lines in making party line taps, order Catalog No. 86. The tap can't slacken off. This connector is for No. 12 wire or smaller.

Unassembled Connector

ASK ABOUT KEARNEY CERTIFIED MALLEABLE SCREW TYPE ANCHORS

Kearney Guy Wire Serving Clips. Eliminate Serving End of Strand. Made of Aluminum, Copper, and Galvanized Iron.

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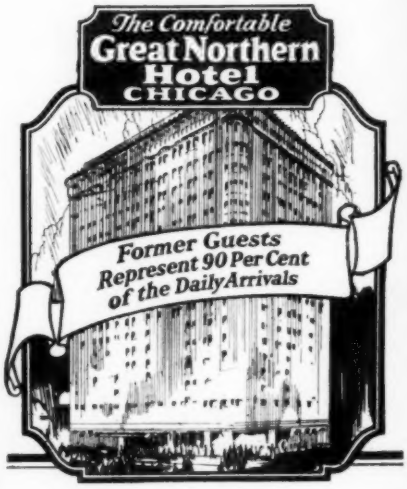


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*400 Newly Furnished Rooms*
*$2.50 a day and up*

*Sample Rooms*
*$4.00, $5.00, $6.00*
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*Dearborn St. from Jackson to Quincy*
New Garage One-Half Block